THE IRON TRADE REVIEW

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THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

The activity in steel rails that has followed the establishment of the $28 basis for 1903, is the chief feature of the market. It is understood that close to 400,000 tons has been booked for next year, Western roads taking large tonnages, while Eastern orders of good proportions are in prospect from lines that usually lead in the buying. In addition inquiries now in hand amount to 200,000tons. It is also quite certain that some orders taken for this year will be carried past Jan. 1. Rails at $28 and billets at $33 to $35 emphasize the peculiar situation in the steel market. It will not continue indefinitely, but at the same time any great increase in the supply of steel going on the market seems rather remote. Foreign steel in unimportant quantities continues to come in. Chicago reports a sale of 3,000 tons of German steel at $33 delivered. Foreign pig iron is supplementing to some extent the supply in the East, but the movement will be limited by the advance in Scotch, English and German irons which are about $1 higher than in early May, at Atlantic seaboard, ocean freights as well as foreign markets having advanced. There is now little foundry iron available for delivery this year. Virginia furnaces will furnish practically all that can be had from the South. Prices are based on $18 to $18.50, Birmingham, and are higher within the week. At the moment there is no special buying for next year. In Bessemer iron the expected purchases of the United Steel Corporation for the second quarter of 1903 are still discussed. It is understood that $16.50 is the corporation's offer, or about $4 a ton below the price established by recent sales. Gray forge iron is increasingly scarce. Sales of 11,000 tons the past week were at $20.75, Pittsburg, or $20 at Valley furnace. Foreign ferro-manganese and spiegel are required in increasing quantities, as domestic steel companies are crowding their production of Bessemer iron. A purchase of 20,000 tons of German spiegel for Pittsburg delivery is pending, the price being about $24 delivered. The strike of blast furnace workers in the Mahoning and Shenango Valleys ended as predicted in a 10 percent advance in wages, the men going back to work after five days' idleness, abandoning their impossible demand for an eight-hour day. Production was cut down 50,000 to 60,000 tons by the interruption. Eastern Pennsylvania furnaces have suffered a curtailment of output by the anthracite strike and in the past week the strike of 10,000 miners in the New River and Pocahontas districts of West Virginia has cut off the coke supply of a number of Southern Ohio furnaces. Thus all the developments in the iron industry for months, starting with the railroad embargo in November, have been against the overtaking of consumption by production. The same condition appears in finished lines, though less marked in sheets and bar iron than in other material. Bar iron is less firm in the Chicago district in spite of high scrap and increased labor cost. In structural material heavy buying for delivery in 1903 is still the rule. The steel corporation companies producing rails, bars, plates and shapes are reported to have booked 1,000,000 tons in those lines for next year.

It is believed nearly all the Southern Ohio furnaces will bank by the end of the week, owing to the West Virginia coal strike, though none have stopped as yet.

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
429 PARK BUILDING, June 11.

The strike of the blast furnace workers in the Mahoning and Shenango Valleys, as predicted, was short lived and was settled the latter part of last week, the men receiving a uniform advance in wages in lieu of the eight-hour day. All of the furnaces that were banked are again in operation and by the end of this week will be turning out their normal capacity. As a result of the strike the loss in pig iron production is estimated at from 50,000 to 60,000 tons. Despite heavy recent sales of iron the market continues active and the buying of foundry and forge irons for delivery the remainder of the year is quite heavy. Sales of foundry iron amounting to 5,000 tons have been made during the week at prices ranging from $22.25 to $22.75 for No. 2, while two sales of forge iron aggregating 11,000 tons have been made at $20.75 delivered, Pittsburg. There has been nothing doing in Bessemer and interest is centered in the coming purchase of iron by the United States Steel Corporation. It has been hinted that the corporation is averse to paying more than $16.50 at the furnace for its iron for delivery in the second quarter of next year. Recent sales show this price to be fully $4 below the market. The purchase of this iron and the price to be paid are to be considered this week and negotiations may soon be taken up.

In finished lines the market continues remarkably strong. The tonnage closed on plates, rails and structural shapes with the constituent companies of the United States Steel Corporation for delivery next year amounts to fully 1,000,000 tons, rails alone amounting to nearly 400,000 tons. The pipe market is also exceedingly strong in all lines both the National Tube Co. and the independent manufacturers having orders on their books for deliveries extending over many months.

At the meeting of the plate manufacturers in New York last week it was decided to continue the quotations which have been ruling for some time. Many of the smaller interests, however, were in favor of advancing prices but the large plate producers did not favor an advance and the official price remains the same. On plates for fairly prompt shipment, however, premiums from $2 to $4 per ton are asked and only on extended deliveries and on large lots can the agreed quotations be secured. Meetings of the wire nail and cut nail manufacturers were held last week. The former continued existing quotations while the latter made a few slight advances in extras on the smaller sizes. However the bulk of the business will continue to be taken at the old prices.

The importation of steel and ferro-manganese from England and Germany continues. The scarcity of spiegeleisen is also pronounced and the United States Steel Corporation is now negotiating for the purchase of 20,000 tons of the German product. It can be laid down in Pittsburg at about $24.

PIG IRON.—While the blast furnace workers in the Mahoning and Shenango Valleys were on a strike less than a week, the furnaces that banked are not yet operating at

their normal capacity, and pig iron deliveries will be still further interfered with. During the past week there was considerable buying of foundry and forge iron all for delivery through the second half of the year. No. 2 foundry seems to lead the way in the upward march and sales have been reported at $22 at the furnace or $22.75 delivered. We note the sale of 800 tons for delivery through the second half of the year at $22.50, delivered and other sales aggregating more than 4,000 tons have been made at prices ranging from $22.25 to $22.75 delivered. We also note the sale of 8,000 tons of forge iron for delivery through the second half at $20.75 delivered and a sale of 3,000 tons at the same price for the same delivery. There have been no sales of importance of Bessemer iron although the purchase of the United States Steel Corporation which will occur shortly will establish a new price for next year's deliveries. We revise quotations as follows:

Bessemer, Valley	$20 00 to 21 50
Bessemer, Pittsburg	20 75 to 22 25
No. 1 Foundry	22 50 to 23 25
No. 2 Foundry	22 25 to 22 75
No. 3 Foundry	21 25 to 21 75
Gray Forge, Pittsburg	20 50 to 20 75
Chilled Basic, Valley	20 75 to 21 00
Chilled Basic, Pittsburg	21 50 to 21 75

STEEL.—Domestic steel is being quoted nominally at $35 for Bessemer billets. The past week has been somewhat quiet so far as the buying of foreign steel is concerned, but prices are unchanged, $32.50 being quoted for billets and $33 for sheet bars, delivered at Pittsburg.

FERRO-MANGANESE.—The quotations on domestic manganese are merely nominal at $52.50, delivered at buyer's mill. German manganese is quoted at $52 and English at $49, delivered, Pittsburg. The United States Steel Corporation is negotiating for spiegeleisen with German producers.

SPELTER.—Owing to a strike in the Missouri-Kansas district the price of spelter continues to advance. Prime Western grades are quoted at 4.75c to 4.80c, Pittsburg, while no futures are being offered.

MUCK BAR.—Little muck iron is being offered and it is being quoted at $36 to $36.50.

SKELP.—We note the sale of 500 tons of iron skelp at 2.25c, Pittsburg. There is practically no steel skelp on the market and we therefore withhold quotations.

RAILS AND TRACK MATERIAL.—The constituent companies of the United States Steel Corporation have closed contracts for close to 400,000 tons of rails for delivery next year and large inquiries are now pending. The tonnage that will be carried over cannot be estimated for four or five months, but it is believed it will be large. We make the following quotations: Standard sections, 50 pounds and over, in lots of 200 tons and over, $28; car lots and less than 200 tons, $30; less than car lots, $32; light rails, 8 pounds, $45; 12 pounds, $42; 16 pounds, $39; 20 pounds, $37; 25 to 40 pounds, $34 to $36. Track material: Spikes, 2c to 2.05c; track bolts, square heads, 2.50c; hexagon heads, 2.65c; fish plates, 1.60c.

PLATES.—At a meeting of the plate manufacturers held last week it was decided to continue present quotations, though several mills will not observe them. Small lots for prompt shipment command from $2 to $4 above the agreed basis. All the mills report demand heavy with considerable business already closed for next year. We make the following quotations: Tank plates, ¼-inch thick and up to 100 inches in width, 1.60c at mill, Pittsburg; flange and boiler steel, 1.70c; marine, ordinary firebox, A. B. M. A. specifications, 1.80c; still bottom steel, 1.80c; locomotive firebox, not less than 2.10c, and it ranges in price to 3c. Plates more than 100 inches wide, 5c extra 100 pounds. Plates 3-16 of an inch in thickness, $2 extra; gauges Nos. 7 and 8, $3 extra. These quotations are based on carload lots, with 5 cents extra a hundred pounds for less than carload lots. Terms, net cash, in 30 days.

BARS.—Demand for bar iron is reported good and there is already considerable buying for next year. Steel bars are being sold in small lots almost entirely. We make the following quotations: Bessemer steel bars, 1.60c; open-hearth, 1.70c; plow beams and cultivator beams, 1.60c, net; channels, angles, zees and tees, Bessemer under 3 inches, 1.70c; over 3 inches, 1.80c; bar iron, 1.70c to 1.80c, Pittsburg, with full freight added to point of delivery. Hoops and bands are quoted at 1.90c, full extras, in 250-ton lots and over, and 2c in less than 250-ton lots; refined iron bars, 2c and upwards.

PIPES AND TUBES.—Demand for boiler tubing and casing is very heavy and a large tonnage is now carried on the books of the National Tube Co. and the independent producers. We quote the following discounts to jobbers in carload lots, Pittsburg:

MERCHANT PIPE.

	Black. Per cent.	Galv. Per cent
⅛ to ⅜ and 11 to 12 inches	60	48
½ to 12 inches	67	55

Discounts to consumers in carload lots, Pittsburg, are revised as follows:

BOILER TUBES.

Steel.

	Per cent.
1 to 1¼ inches	42½
2¼ to 5 inches	61
1¾ to 2¼ and 6 to 13 inches	55½

Iron.

	Per cent.
1 to 1¼ inches	39
2¼ to 5 inches	48
1¾ to 2¼ and 6 to 13 inches	38

CASING.

	S. and S. Per cent.
2 to 3 inches	58
3½ to 4 inches	60
4½ to 12½ inches	63

SHEETS.—A good demand continues for the heavier gauges of sheets, while a fair amount of business is being closed in the lighter gauges. Many of the mills are now catching up on their business, owing to the slight lull in the lighter sizes. Quotations remain unchanged as follows: Nos. 10 and 12, 2.40c to 2.50c; 14 and 15, 2.50c to 2.60c; 16, 2.60c; 18 and 20, 2.70c to 2.80c; 22 and 24, 2.80c to 2.90c; 26, 2.90c to 3c; 27, 3c to 3.10c; 28, 3.10c to 3.20c; 29, 3.25c to 3.35c; 30, 3.35c to 3.45c. Galvanized sheets, in carload lots to consumers, are quoted at 3.05c for Nos. 10 and 11, 3.45c for Nos. 18 to 21, 4.20c for No. 27, and 4.50c for No. 28. Galvanized sheets, mill shipments in carload lots to consumers are as follows: Nos. 10 and 11, 3.05c; Nos. 12 to 14, 3.15c; Nos. 15 to 17, 3.25c; Nos. 18 to 21, 3.45c; Nos. 22 to 24, 3.75c; Nos. 25 and 26, 4c; No. 27, 4.25c; No. 28, 4.50c.

STRUCTURAL MATERIAL.—The situation in structural material continues practically unchanged. Small lots from stock are being sold at 2.75c to 3c, while all the mills are now taking orders for delivery next year. We make the following quotations: Beams and channels, 3 to 15 inches, 1.60c; 18 to 24 inches, 1.70c; tees, 1.65c; zees, 1.60c; angles from 3 to 6 inches, 1.60c; universal mill plates, 1.60c.

WIRE AND WIRE NAILS.—A meeting of the wire and wire nail manufacturers was held last week and quotations were reaffirmed. Inasmuch as the present is an off season many of the mills are running on stock. We make the following quotations: Wire nails in carload lots, $2.05 per keg; smaller lots, $2.10 and $2.15; plain wire, $2 in carload lots and $2.10 in less than carload lots to retailers; galvanized wire, $2.40 in carload lots; polished staples, $2.20, and galvanized staples, $2.60; painted barb wire, $2.60, and galvanized, $2.90. These prices are quoted on a Pittsburg base, plus the actual freight to destination. Cut nails are held at $2.05 in carload lots and $2.10 in less than carload lots, Pittsburg, plus freight to destination.

MERCHANT STEEL.—Demand for shafting is reported strong and the largest producer reports business booked for fully four months, a condition extremely out of the ordinary in the shafting trade. Quotations are unchanged as follows: Turned, cold rolled ground shafting in carload lots is quoted 50 off, and in less than carload lots, 45 off; tire steel, 1.80c in carload lots and 2c less than carload lots; toe calk, 2.10c to 2.25c; sleigh shoes, 2.10c to 2.25c; machinery steel, 1.70c; smooth machinery steel, 1.75c. Tool steel, 7 cents and upwards.

OLD MATERIAL.—A fair amount of business is being offered in old material but the mills are not anxious to buy in large lots at ruling quotations. We make the following quotations, gross tons: Car wheels, $21 to $21.50; steel rails, mixed lengths, $21; cast scrap, $18.50 to $18.75; No. 1 wrought, $23 to $23.50; wrought turnings, $13.50 to $14; heavy melting stock, $21 to $21.50.

COKE.—For the week ending Saturday, May 31, the production in the Connellsville region amounted to 249,995 tons, a

slight increase over the production of the previous week. The production of the lower region amounted to 34,935 tons, which was also a slight gain over the output of the week previous. Shipments from the region amounted to 12,400 cars. Connellsville furnace coke on contracts for future delivery is held at $3.50 per ton and foundry at $2.75 to $3. Outside cokes are held at prices about 25 cents lower than the above.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
519 MONADNOCK BLOCK, June 10.

Railroads have been heavy factors in the purchases of the past week, and it is estimated that 150,000 tons of standard rails have been sold in this market for next year's delivery. With the exception of the weakness in bar iron, there is little change to be noted in the conditions that have prevailed for some time in Chicago. Although the nominal quotation of this product is 1.95c Chicago, few if any of the mills are maintaining it, and it is reported that an order of 1,000 tons was taken recently at as low as 1.75c by a Western mill, while considerable business is reported to have been taken at 1.80c and 1.85c. This one weak spot in the local market is difficult to explain in view of the firm tone of prices in Central and Pittsburg territory and the high cost of scraps and pig iron. It may be a natural effort to correct the disparity between iron and steel bars. Pig iron sellers report considerable inquiry for next year's delivery, and some additional sales have been closed for deliveries extending to July, 1903, on the basis of $18 for No. 2 foundry at Birmingham.

PIG IRON.—Not a large amount of iron is being sold in this city, but this is no indication of any weakness. On the contrary, the market is growing in strength. None of the Southern furnaces are now selling on the $16 basis and it is stated that an official advance of $1 a ton will in all likelihood be announced this week. For delivery in the third quarter, $18 to $18.50 Birmingham is being quoted generally. There was considerable Southern iron sold last week for next year's delivery, and one seller reports that all the orders it has taken for this period have been on the basis of $18 Birmingham for No. 2 foundry. Others report they are quoting $16.50. It appears to be the policy of some sellers to keep on advancing prices until the limit is reached, when they expect the market will drop and pig iron will resume a more natural selling basis. One of these firms is of the opinion that values cannot go much higher, and as they say they are already too high, the sooner they reach the limit, the sooner they will get down to their proper level. That the consumption of metal is going on at a tremendous rate, may be taken from the fact that a local furnace company recently sent out letters to its customers, asking if they did not actually need the iron for which contracts had been made to reduce their specifications, that the wants of other melters in more urgent need might be satisfied. With but one exception, all these foundries wrote back that they needed all the iron they had contracted for, and would buy more if they could get it. There is some talk of an advance in freight rates of 20 cents a ton to points north of the Ohio River, and 50 cents a ton south of the river, which will be made July 1. Our quotations follow:

Lake Sup. Charcoal...	$23 50 to $24 00	Southern Coke No. 4	$19 65 to $ 0 15
Local Coke Fdy. No. 1	22 00 to 22 50	Southern No 1 Soft...	21 15 to 21 65
Local Coke Fdy. No 2	21 02 to 21 50	Southern No. 2 Soft...	20 15 to 20 6
Local Coke Fdy. No. 3	20 00 to 20 50	Southern Gray Forge	19 65 to 20 15
Local Scotch Fdy. No. 1	21 00 to 21 50	Southern Silveries....	21 15 to 21 65
Local Scotch Fdy. No. 2	20 50 to 21 00	Jackson Co. Silveries	23 50 to 24 50
Southern Coke No. 1	21 15 to 21 65	Ohio Strong Softeners	24 10 to 24 60
Southern Coke No. 2	20 65 to 21 65	Alabama Car Wheel..	23 65 to 24 10
Southern Coke No. 3	20 15 to 20 65	Malleable Bessemer..	22 00 to 22 55

BARS.—There is considerable competition among all the manufacturers for the business that is being offered, and there is a wide range in the price of bar iron. The nominal quotation is 1.95c, and one Eastern seller is quoting 2.15c. This price, however, is not being maintained, and one mill is reported to have accepted an order for 1,000 tons at 1.75c. This case is an exceptional one, the price generally prevailing being 1.80c to 1.85c. We quote Chicago delivery: Bessemer steel, 1.75c to 1.85c; angles, less than 3x3, 1.85c; iron, 1.85c to 1.95c; hoops, 2.15c. Prices out of store, steel, 2c to 2.10c; iron, 2.15c to 2.25c; hoops, 2.40c to 2.45c; angles, 2.50c to 2.60c.

SHEETS.—There is quite an improvement in the demand for all sizes of sheets, and the market has resumed its former activity. Mills are still unable to give prompt delivery on the heavier gauges. We quote: No. 27 black, mill shipments, Chicago delivery, 3.15c to 3.25c; galvanized, 4.40c to 4.50c; out of store, No. 27 black, 3.45c to 3.55c; galvanized, 4.70c to 4.80c.

STRUCTURAL MATERIAL.—Though plans are being made for the erection of several large office buildings in this city, they have not progressed to the point where it is necessary to ask mills to quote on the structural material. With the exception of a few small orders placed for next year's delivery, all the business transacted in the past week has been done through jobbers and structural yards. These report an active demand for all the sizes they have in stock. We quote mill prices as follows: Beams 15 inches and under, 1.75c; 18 inches and over, 1.85c; structural angles, 3x3 to 6x6, 1.85c; angles, channels and tees, smaller than 3 inches, 1.85c base; plates, 1.75c. Prices on lots from store are based on the necessities of buyers and according to the size of order. Mills are sold up for the entire year, and consumers in immediate need of material must go to jobbers for the same or buy abroad. Store prices vary from 2½ to 4 cents a pound.

BILLETS.—A sale of 3,000 tons of German billets was made a few days ago, the price being $33, Chicago. There is plenty of inquiry for billets in this market, but little can be bought. We quote domestic Bessemer billets, $36 to $38; open-hearth, $38 to $40.

RAILS AND TRACK SUPPLIES.—Since the local mill opened its books for the delivery of standard sections next year, it is estimated that contracts for upwards of 150,000 tons have been closed for Western delivery. There will be a considerable tonnage carried over also from this year's orders. There is a corresponding heavy demand for light rails and track supplies, but mills cannot guarantee delivery on these materials prior to November. We quote standard rails, $28; second quality, $27; light rails, 45 pounds, $34 to $35; 12 pounds, $40 to $41 with regular differentials for intermediate sizes; out of store $45 to $50; splice bars, 2.25c; spikes, carload lots, 2.45c to 2.55c; track bolts 3½x3¼, with square nuts, 2.85c per 100 pounds; with hexagon nuts, $3, with usual differentials for other sizes.

MERCHANT STEEL.—With the withdrawal from the market of one of the largest manufacturers of this material, new business is not of great proportions and is mainly for material from stock. This company reports that its shipments into this territory during May were the largest in point of tonnage of any month of May in its history. We quote mill shipments, Chicago delivery, as follows: Smooth finished tire steel, 1.95c to 2c; open-hearth spring steel, 2.65c to 2.75c; sleigh shoe, 1.75c to 1.80c, flat sizes; concave and convex, 2c; out of store, 2.15c; cutter shoe, 2.40c to 2.60c; machinery steel, 2.15c to 2.25c, base; plow steel, 2.50c and upwards, according to quality; toe calk, 2.25c to 2.35c; out of stock, 3c to 3.10c; ordinary tool steel, 6c to 7c; specials, 13c and upwards; less than carload lots, 5 percent to 10 percent higher, cold rolled shafting, carload lots, 50 percent off, Chicago; less than carload lots, 45 percent off, Chicago.

CAST IRON PIPE.—Current business is confined to small orders. These are plentiful, and the aggregate tonnage is fairly large. We quote 4-inch water pipe, $34 carload lots, f. o. b. Chicago; 6-inch water pipe and larger sizes, $32; gas pipe $1 a ton higher.

MERCHANT PIPE.—There is a good demand for all sizes, and the outlook is very favorable. Prices are being firmly maintained. We quote as follows:

MERCHANT PIPE, RANDOM LENGTHS.

	Black Per cent.	Galv. Per cent.
⅛ to ⅜ in.	56⅔	44⅔
¼ to 12 in.	63⅓	51⅓

BOILER TUBES.

Steel.

	Per cent.
to 1¾ in.	35
1¾ to 2¾ in.	45
1¾ to 5 in.	55
6 to 13 in.	47½

Iron.

	Per cent
1¾ in.	35
1¾ to 2¼ in.	32½
2½ in.	35
2¾ to 5 in.	42½

PLATES.—Jobbers report a very active demand, orders com-

ing in from all over the country. We quote mill prices, Chicago delivery: Tank steel, ¼-inch and heavier, 1.75c to 2.15c; flange steel, ¼-inch and heavier, 1.85c to 2.25c; from stock, tank steel, ¼-inch and heavier, 2c to 2.35c; 3-16, 2.10c to 2.45c; No. 8, 2.20c to 2.55c; flange steel, 2.35c to 2.50c.

Wire and Wire Nails.—The traveling men of the local manufacturer report that the prospects of a heavy crop this year are very bright, and that there will be an unprecedented demand this fall for all kinds of wire products. Very little stock is being accumulated in the warehouses of manufacturers, who are about two months behind in the shipment of its orders. We quote as follows: Smooth wire, carloads, $2.15; painted barb wire, $2.75; galvanized barb wire in carload lots, $3.05; wire nails, carload lots, $2.20; staples, carload lots, $2.30; jobbers' prices to retailers, 5 cents higher than above for carload lots, and 10 cents higher for less than carload lots.

Coke.—The scare among consumers, resulting from the coal strike, has caused an advance of 25 cents a ton in both Connellsville and West Virginia coke. Many foundrymen fearing a repetition of the scarcity of material that prevailed last winter, bought heavily when the strike was declared, and there has been a stringency in the market for the last two or three weeks. We quote standard 72-hour Connellsville foundry, $5.50; for spot delivery, $5.75; Virginia and West Virginia coke, $5.25 to $5.50.

Old Material.—With the exception of relaying rails and old steel rails, there is not a very heavy demand for scrap. All the mills have large stocks on hand, and as most of them contemplate shutting down for a few weeks during the summer months, they are not active buyers. Prices, however, are firmly maintained. Relaying rails are almost as good as gold bonds, and command a price from $2 to $4 a ton higher than the cost of new rails. We quote gross tons as follows:

Old iron rails	$24 00 to $25 00	Relaying rails	31 00 to 32 00
Old steel rails, long lengths	23 00 to 24 00	Old wheels	19 50 to 20 00
Old steel rails, short lengths	17 00 to 18 00	Heavy melting steel	19 00 to 20 00
		Mixed country steel	13 50 to 14 00

The following are selling prices per net ton:

No. 1 R. R. wrought	$19 50 to $20 00	Steel axles	$19 00 to $19 50
No. 2 R. R. wrought	18 00 to 18 50	Cast borings	9 00 to 9 50
Dealers' forge	15 50 to 16 00	Wrought turnings	13 00 to 13 50
No. 1 busheling	13 50 to 14 00	Iron axle turnings	14 00 to 14 50
No. 1 R. R. & mch. cast	14 25 to 14 75	Steel axle turnings	13 50 to 14 00
Railway Malleable	15 00 to 15 50	Stove plates	11 00 to 11 50
Country malleable	13 00 to 14 00	Old iron splice bars	21 00 to 21 50
Iron axles	24 50 to 25 00		

CLEVELAND.

OFFICE OF *The Iron Trade Review*,
1064 Rose Building, June 11.

The May shipments of iron ore from upper lake ports amounted to 3,293,235, or nearly 20 percent less than the 4,000,000-ton rate that seemed to be indicated by the April figures. The total to June 1 is 5,148,137 tons, as against 1,589,775 tons to that date last year, when there was no April movement. The past week has brought a serious delay in the blocking of the American locks at the Soo, these having been out of business from Friday, June 6, to Wednesday, June 11. Ore boats that should have reached Lake Erie ports Tuesday will not get down before the latter part of the week and some may be carried over to next week.

Pig Iron.—The situation so far as foundry buyers are concerned is practically unchanged. The strike at Valley furnaces caused a further stringency, but fortunately the interruption to the pig iron output was of short duration. Valley furnace capacity is less by two furnaces than would have been the case but for the strike. Both are out for repairs, but would have been kept running had not the strike intervened. Foundries are still having their troubles because of the failure of shipments, and the Scotch irons of the Valleys have been in especially short supply. In this district there is little buying of iron for 1903, but Valley furnaces taking such orders are quoting $20 to $21 for No. 2 iron, as against $21.50 to $22 at furnace for delivery this year. Southern Ohio furnaces are embarrassed by the shortening of their coke supply, drawn from the New River and Pocahontas districts, and several may have to bank. Ohio River furnaces have been quoting as high as $22 and $22.50 at furnace for No. 2 iron. The supply of forge iron grows smaller, and it is now quoted close to the basis for foundry grades a sale at $20 at Valley furnace being reported. Bessemer iron has sold at $20.50 to $21 at Valley furnace, but it is believed any purchase for the second quarter of 1903 made by the steel corporation will be at a considerably lower figure. We quote f. o. b. Cleveland:

Bessemer	$20 50 to $21 50	Scotch No. 1	$21 75 to $22 75
No. 1 Strong F'dry	21 75 to 22 75	Scotch No. 2	21 00 to 22 00
No. 2 Strong F'dry	21 00 to 22 00	Gray forge, Valley	19 00 to 19 50
No. 3 Foundry	19 75 to 20 25	LakeSuperior charc'l	22 00 to 23 00

Finished Material.—Shipyards are evidently making plans for next season's work, the past week bringing out orders for 5,000 to 6,000 tons of plates and shapes, to go into new vessel work. Buying of structural material for next year is going on steadily and the policy of the large interests in holding prices on both plates and shapes is encouraging free commitments. The plate agreement, in spite of newspaper reports, is still operative. There has been a disagreement among the pool members growing out of the sale of prompt material at premiums of $2 to $5 a ton by interests presumably booked for months ahead, but the official price of 1.70c Cleveland is still maintained. The sheet trade shows no improvement in the supply of certain of the heavier gauges. For No. 8, 3-16 and ¼-inch material there is a strong demand, and 2.10c Cleveland is paid for 3-16-inch and heavier, and 2.25c Cleveland for No. 8. Light sheets are in fair demand, but without the scramble that appears in other lines. The independent mills evidently produce a sufficient tonnage to make them a factor in the market. We quote Cleveland prices on mill sales of black sheets—No. 24, 2.90c to 3c; No. 26, 3c to 3.10c; No. 27, 3.10c to 3.20c; and the following prices out of stock: No. 10, 2.35c to 2.50c; No. 12, 2.45c to 2.60c; No. 14, 2.55c to 2.70c; No. 16, 2.95c to 3.0c; No. 18, 3c to 3.15c; No. 20, 3.05c to 3.20c; Nos. 22-24, 3.15c to 3.30c; Nos. 22-26, 3.25c to 3.40c; No. 27, 3.35c to 3.50c; No. 28, 3.45c to 3.60c, for one pass cold rolled. For full cold rolled .10c extra is charged. On galvanized sheets Cleveland prices to consumers are as follows for carload lots: Nos. 10 and 11, 3.15c; Nos. 12 to 14, 3.25c; Nos. 18 to 21, 3.55c; Nos. 22 to 24, 3.85c; No. 27, 4.35c; No. 28, 4.60c. The turning of bar consumption from iron to steel as the result of the last advance in iron is in constant evidence. For early delivery there is little available mill supply of bar iron, and premiums are paid in some cases. Store prices range from 1.90c to 2c Cleveland, indicating that owners of stocks are not disposed to put their price in the usual relation to the quotations from mill.

Old Material.—There is perhaps a large offering of mill scrap than in recent weeks. Otherwise the market shows little change. We quote f. o. b. Cleveland, all for gross tons:

CINCINNATI.

June 11.

There is an uncertainty about the iron trade just at this time that makes it rather hard for both producers and consumers to know just where they are. The situation is largely due to the fact that the strike among the coal miners has extended into the West Virginia fields. Word has been received here that some of the Southern Ohio furnaces have announced that they will shut down at least temporarily. It is impossible to predict farther than a few days ahead the character of the market. Assurance comes to buyers from the fact that they have largely bought of pig iron for the year and are not as sorely in need as they might have been at any other time previous to this. On the other hand there is practically no iron being offered for quick delivery and the larger Southern producers are entirely out of the market and will remain so until Sept. 1.

The various branches of the trade are about as they have been heretofore, the demand for finished material being very good, the sales of machinery and all sorts of finished articles by manufacturers being very large and the general condition of allied trades very satisfactory. Advances in machine tools are predicted, and the outlook is for a continued high pressure of business during the remainder of the year.

Pig Iron.—As stated above the strike situation has begun to make itself felt and promises to have still more of an effect before the week is out. A number of furnaces will be compelled to bank on account of inability to get coke. Alabama and

Tennessee furnaces are out of the market for quick delivery and could afford no relief in case of a very heavy demand. Still it is not likely that there will be anything like a famine in pig iron. The prices during the past week at which sales have been made are $17.50 to $18.50 and while these may be advanced somewhat they are not likely to be far from wrong for the next week at least. There have been some sales of foundry iron and a considerable demand for car wheel iron. All of the iron that can possibly be shipped prior to Sept. 1 is being snapped up without hesitation. If pig iron prices advance there is no doubt that foundrymen will advance their price also, but a good feature about it is that they are bought so well ahead and practically covered until the end of the year that they will not likely be compelled to resort to radical measures. Following are the prices for pig iron at Cincinnati:

Southern Fdy. No. 1	$20 75 to 21 75	Gray Forge	$19 00 to 20 00
" " 2	20 25 to 21 25	Northern Fdy. No. 1	23 60 to 24 10
" " 3	19 75 to 20 75	" 2	23 10 to 23 60
" " 4	19 25 to 20 25	Southern C. W. Iron	25 25 to 25 75
So. Fdy No. 1 soft	20 75 to 21 75	Malleable coke iron	22 75 to 23 50
So. Fdy. No. 2 soft	19 75 to 20 75		

FINISHED MATERIAL.—There is nothing striking about the market for finished material when one takes into consideration the situation as it has existed up to this time. The demand is still very good and the movement is as heavy as the production of the mills will allow. Complaints are frequent about deliveries, though consumers are getting used to this condition and appear to take it as a matter of course, that they cannot get material within a very short time from the filing of orders. There is a continued heavy demand for structural material and bar iron manufacturers say that they would be justified in increasing their capacity if they were assured that present conditions would maintain. Bar iron remains at 1.92c and bar steel at 1.72c, both iron and steel bars being quoted at 2.20c out of store. Angles are 2.35c and 2.50c out of store. Sheets are quoted at 2.50c for No. 12 and 2.35c for No. 10.

OLD MATERIAL.—Although the tendency is for higher prices in pig iron there is no marked movement in old material. This is, of course, due to the fact that the demand is not immediately pressing and offerings are made rather more freely. The large users of old material seem to be pretty well covered. Following are quotations:

Old No 1. Wrought Railroad, net tons	$ 19 50 to 20 00
Cast Machine and Foundry, net tons	14 00 to 14 25
Old Iron Rails, gross tons	25 00
Old Steel Rails, gross tons	24 50 to 24 75
Old Short Lengths, gross tons	17 50 to 18 00
Old Iron Axles, gross tons	25 00
Old Iron Car Wheels, gross tons	19 00 to 19 50
Stove Plates, gross tons	11 00 to 11 25
Wrought Turnings, net tons	14 00
Cast Borings, net tons	8 50 to 8 75

PHILADELPHIA.

June 10.

Several foundries have purchased lots of Canadian foundry iron and are finding it to give very good satisfaction, so that it may be expected that further efforts will be made to obtain relief from that quarter as long as quotations warrant paying the duty. Foreign steel is also coming in in increased quantities and serves to help out on small contracts, though consumers in general complain that they are unable to keep up with their work in a way satisfactory to all concerned.

PIG IRON.—New quotations appear to be made at every transaction and this lack of uniformity makes the market practically unquotable. The volume of business is very small and is principally confined to such lots as can be delivered immediately. Some sellers take exception to the prices asked for material, but as they have nothing to sell, they are not in a position to do any good. From $21.50 to $22.50 is being paid for No. 2 X foundry which can be delivered promptly. Occasionally a small lot may be picked up at the inside figure, though generally there are delays in delivery, which account for the bottom price. For shipment during the latter months of the year Scotch irons are bringing $21.50 to $23, Middleboro $20 to $21, and domestic brands come within the following range: No. 1 X foundry, $20.50 to $21.50; No. 2 X foundry, $19.75 to $20.50; No. 2 plain, $19.50 to $20; standard gray forge, $18.50 to $19; ordinary gray forge, $18 to $18.50; basic, $19 to $19.50.

FINISHED MATERIAL.—No changes are to be noted in the general conditions surrounding the plate and structural market. Heavy premiums are readily paid where material is obtainable. For Philadelphia and vicinity prices will average: Plates ¼-inch and thicker, 2c to 2.10c; steel bars, 1.85c to 1.95c; iron bars 2c to 2.05c; beams and channels, 1.90c to 2.10c; angles, 2c to 2.50c depending on time of delivery.

OLD MATERIAL.—Considerable stuff is coming from abroad and as several mills are closed this can not be delivered as promptly as it should and on the whole prices show signs of weakening. Bids and offers are about as follows for deliveries buyers' yards: Choice railroad scrap, $23 to $24; ordinary light scrap, $15.50 to $16; machinery cast, $17.50 to $18.50; heavy steel scrap, $21 to $21.50; old iron rails, $25 to $26; wrought turnings, $16 to $16.50; cast borings, $10 to $10.50; old iron axles, $29 to $30; old steel axles, $26 to $27; old car wheels, $20 to $21.

A Large Iron Anchor.

The largest anchor said to have ever been forged has recently been turned out in the great forging shop of the Charlestown Navy Yard, says the Boston *Post*. It weighs 16,500 pounds, and the cost of material and construction is nearly $2,000. Five men worked on it for over a month, hammering and smelting and welding it. This great anchor is to form part of the equipment for one of the new battleships that are to be added to Uncle Sam's navy. The making of it was first tried as an experiment. Anchors of as great weight have been made of cast steel, and such are used on some ships of the American navy, as well as on British warships. But, as cast steel is more likely to be broken, the navy officials desired to secure anchor of equal weight in wrought iron, and it has remained for the equipment department of Charlestown yard to prove that their manufacture is possibe. So great has been the success of this experiment that the Government has ordered 22 of equal size and weight to be furnished, two for each of the eleven first-class battleships which are to be built.

The mammoth anchor, which, barring unusual conditions of undertow or violent storm, is sufficient to hold in her moorings the largest battleship afloat, is nearly 15 feet in length from crown to shackle, and about 9½ feet wide from one arm point to the other. The heavy cross bar is also about 15 feet in length. The palms, or broad flat pieces which are welded to the arm ends, are about 32 inches in width. A specially heavy chain cable, larger than any hitherto made, is required to hold this anchor.

Breaking Up Cast Iron Guns.

The Government recently sold a large number of old cannon, among the largest of which were some 15-inch smooth-bore Dahlgrens cast in the early '60's. The purchasers were confronted with the problem of converting these heavy pieces of cast iron into marketable shape as scrap iron, wherein no single piece should exceed 200 pounds in weight. After doing considerable experimenting they adopted the method of drilling rows of holes longitudinally, afterwards driving steel wedges into these holes until the gun split open. To permit of the drilling being done as rapidly as possible the guns were jacked up on roller bearings so that they could easily be revolved, when a frame carrying 15 drills was set over the gun and 1-inch holes drilled to a depth of about 7 inches. In this way the guns were split into suitable sections when they could easily be broken into smaller pieces. Each gun weaighed 42,000 pounds and had a thickness of metal varying from 17 inches at the breach to 3 inches at the muzzle. Many of these guns had never been fired and these were found much more difficult to break up than those which had been in use.

A joint meeting of the stockholders of the Railway Steel Spring Co. and the Steel Car Wheel Co. was held June 3 in Jersey City. It was decided to ratify the merger of the two companies as proposed by the directors in the circular issued May 9. It was decided to increase the board of directors from 11 to 15 and the board now includes the following: Samuel R. Callaway, Julius E. French, Truman H. Newberry, Charles Scott, Charles Scott, Jr., Frank S. Layng, George B. Sloan, Jr., Frank B. Smith, S. L. Schoonmaker, Philo N. French, William H. Silberthorn, James C. Beach, J. W. Fuller, C. W. Barnum and Gen. Charles Miller. Charles H. Halcomb, who was a director in the old board, resigned.

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THE GREATER DAY OF THE JOBBER.

The status of the jobber of iron and steel products has been a matter of comment at intervals in connection with the changes of the past three years. From the belief that the middle man's days were numbered, that obtained in the early period of the consolidation regime, sentiment has now swung to the conviction that the jobber is not only to have a longer lease of life but is to be a more influential factor in the trade than ever. It seems strange that almost while the trade was discussing his probable tenure, the jobber began to enlarge his sphere of influence; and today the large producers, so far from making any move to eliminate him, appear to be really magnifying his office.

It was easy to jump at the conclusion when the consolidations were forming, that as they were "integrated" corporations, buying none of the materials of manufacture, and even becoming their own carriers, that they would deal at first hands with the consumer. But it was overlooked in these calculations, that the problem of distribution was quite different from the problem of manufacturing. In manufacture the most effective methods are those dealing with maximum quantities. In distribution the reverse is true; the efficiency of the distributing machinery being gauged by its ability to reach the last man.

It became apparent in the process of whipping the great corporate aggregations—they were scarcely organizations then—into working shape, that their selling departments presented the greatest problems. Buyers who were tossed from the horn of the district office to that of the general sales office, and from central office to mill and back again, will recall how they began to despair of ever doing business again with the directness of their old-time relations with the individual mill. The selling departments of the consolidations, as they began to increase their organizations found that complications increased rather than diminished. The smaller buyer, in dealing direct, wanted terms equal to those of the quantity buyer, and thus in many instances the relation was satisfactory to neither side. The upshot of it was that the manufacturer in many cases gladly left the smaller field to the jobber. The latter, with his diversified lines and his salesmen supplying the trade with a score of different products from a single warehouse, often relieved the manufacturer of a responsibility that would have meant little profit if not an actual loss.

All this time the market has been steadily working in the jobber's favor. Prices have been on the up grade since the summer of 1900. For much of the intervening time the mills have been well sold ahead, and the buyer, who often was bound to supply his wants even at a good premium has learned the way to the jobber's stocks. The line is being more distinctly drawn, too, between the province of the manufacturing seller and that of the distributer. The long list of accounts, the minutiæ of small orders, the waste of cutting to lengths and the difficulty of close supervision of credits, and chief of all, a condition of business that has made it possible for the manufacturers to pick their trade and deal in large lots—all have made the mills willing to work with the jobber. The latter, moreover, has not undervalued the opportunity to enlarge his sphere. By placing liberal contracts with the mills before the conditions now surrounding the market had begun to be fairly developed, he is now serving both consumer and manufacturer and at a good profit to himself. In the small trade in plates and structural shapes he is a far larger factor than ever. The structural trade, as Mr. Carnegie was wont to say, is "a business of infinite detail," and the experience of the past year may open the way to the jobber's permanent participation in it.

Another possibility for the jobber is as an adjunct of the new companies embarking in iron and steel manufacture, or of older companies, independent of the steel corporation, that take up new lines of manufacture. The building up of a trade, which means that a certain number of buyers must be persuaded to leave their old moorings and in place of well tried products of well known makers take up the new and untried, is a work of long time and cultivation. Undertaken by new salesmen who must acquire a personal following, it presents problems of peculiar difficulty. The jobber's chief stock in trade is his clientage acquired in years of close business relations. As competition increases among manufacturers the personal element is likely to cut more and more of a figure, and as the jobber's peculiar advantage from times like the present grow less, he may be compensated in the larger demand for his help from manufacturers. From any standpoint, therefore, the future of the jobber is far brighter than it promised to be when the "trust" revolution came.

The convention of the American Foundrymen's Association to be held in Boston next week is the seventh in the history of a notable movement for the betterment of American foundry practice. The Philadelphia convention of 1896, at which the association was organized, was followed in turn by the meetings at Detroit, Cincinnati, Pittsburg, Chicago and Buffalo, all marked by papers representing the investigations of ambitious workers in a field previously little tilled. The whole movement for the interchange of foundry experience and the building up of a foundry literature marks a change in the status of iron castings in the United

States. It would scarcely have been thought possible ten years ago that in a single decade cast iron could be so strengthened in the position it holds in the engineering world. Its decline in popularity before the increasing prestige of steel was freely predicted. The uncertainties surrounding the production of iron castings were conceded by many. But these have not daunted the few patient investigators who have produced the bulk of the literature growing out of the association movement. Much remains to be done, but the record of what has been achieved is highly creditable. That it has raised foundry practice to its own distinct place in the industrial and engineering fields is reason enough for the perpetuation of the American Foundrymen's Association, and the pity is that the beneficiaries of the association's work and that of its talented secretary, Dr. Moldenke, have been so little appreciative of its value. It is to be hoped more generous support of the work may be met with in the coming year.

THE INTERNATIONAL IRON AND STEEL MOVEMENT.

The changes in American, British and German iron and steel imports that have marked the present year are an interesting study. Great Britain has been importing from Germany at an increasing rate. A statement for the first four months of this year shows that the tonnage of foreign iron and steel unloaded at British ports is coming to be nearly half of the amount going out. In the first four months of this year British imports were 388,677 tons, as against 266,545 tons in the same period of 1901 and 178,940 tons from Jan. 1 to April 30, 1900. Of the 388,677 tons, there was 82,315 tons of pig iron and 107,364 tons of unwrought steel. The slaughter prices of German steel works, under the pinch of domestic hard times, made England a dumping ground for German steel, the above tonnage being about 11 times the 9,773 tons imported by Great Britain in the first four months of 1900. In 1901 for the like period the total was 51,711 tons.

German exports of iron and steel in the first three months of this year were 701,166 tons against 431,919 for the corresponding period of 1901, an increase of 269,247 tons or 62 percent. The chief items of increase are pig iron, merchant iron, blooms and billets and railway material. The exports to Great Britain in the three months were 176,603 tons, or at the rate of 706,412 tons for a year. These figures are beyond all precedent.

Turning now to the inward and outward movement of iron and steel in the case of the United States, the record of the past year, accented in the early months of 1902, is one of increasing imports and markedly decreasing exports. These statistics have been commented upon as reproduced in these columns from month to month. In the *Bulletin* of the American Iron and Steel Association General Manager Swank calls attention to the significance of this showing in these words:

> The above figures of increased imports and decreased exports of iron and steel should not be hastily dismissed by our iron and steel manufacturers. They will, we hope, lead them instead to dismiss the thought that the world's iron and steel markets are to be easily captured and held. The activity in our export trade in iron and steel in the last few years was exceptional and abnormal. Not only is Europe adopting our improved methods of manufacture but it will always have cheap labor, and by these agencies it can hold its own markets and actively and aggressively contend for the possession of neutral markets. For our iron and steel industries, as well as for all other domestic manufacturing industries, our home market must always be our best market, and it should be carefully guarded. The Dingley tariff should be kept free from the touch of all unfriendly hands. It is harming nobody except those foreign manufacturers who look wistfully upon our great consuming markets.

American Steel Foundries Co.

NEW YORK, June 10.—The belief that Judge E. H. Gary would be the first president of the American Steel Foundries Co. appears to have been based on the report recently circulated, but not confirmed, that he is to retire from the chairmanship of the United States Steel Corporation. It is now stated on reliable authority that Joseph E. Schwab, brother of President Schwab, is to be the head of the steel foundry consolidation. Mr. Schwab has been in Europe for a few weeks and is expected to return about July 1. Previous to his departure he severed his connection with the United States Steel Corporation. Mr. Schwab is 37 years of age. His first employment was as draughtsman at Homestead. In 1877 he became superintendent of the structural department of the Homestead Steel Works. In 1891 he was appointed superintendent of the Upper Union Mills. He served in this capacity only six months when he accepted the position of general superintendent of the Duquesne Steel Works and blast furnaces. He resigned about nine months ago to become connected in an executive capacity with the United States Steel Corporation.

Iron vs. Steel Foundries.

One of the questions that appear to be occupying the minds of the foundry interest in most countries at the present time is the extent to which steel foundries are likely in the near future to displace those devoted to the manufacture of iron castings. The number of new iron foundries erected during the last few years is probably a good deal below the number of similar steel foundries. [Not so in the United States.—ED.] The use of steel has recently replaced cast iron for a great many different requirements. As a single case in point, out of many that might be cited, we need only name its much more general employment for rolls and housings. The iron founders can hardly as yet be said to have much felt the pinch of steel castings, because the general conditions of trade have been so prosperous, but there are those who believe that many of the iron foundries will be among the first to experience the effects of a slump. The true character and dimensions of the contest between the two metals cannot as yet be accurately gauged, for many reasons. It is certain that iron founders are, and have for a long time past, been full of work, and there are many who believe that iron castings will long continue to hold their own. The British foundry interest would do well to keep their eyes upon the course of events in the United States, where economic and manufacturing conditions are so readily responsive to new demands and improved and cheapened applications.—[London Iron and Coal Trades Review.

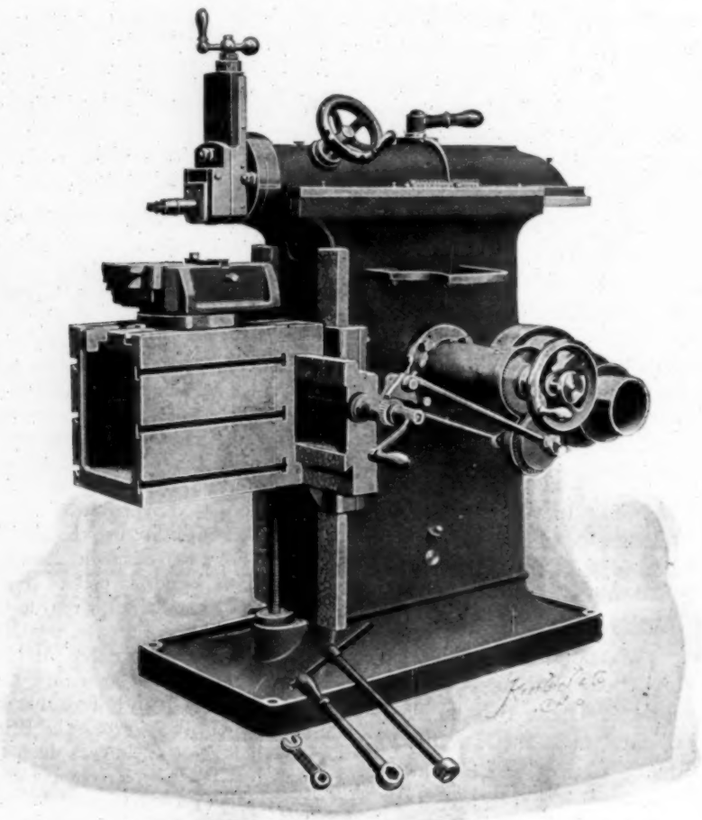
Judge Lacombe, in the United States Circuit Court, New York, this week denied the application of C. H. Wenner Company and others to restrain the United States Steel Corporation from issuing $250,000,000 in bonds and retiring $200,000,000 of the preferred stock of the corporation. At Newark, N. J., at the same time Vice Chancellor Emery granted a rule to show cause why the proposed plan of the United States Steel Corporation should not be enjoined. It carried with it a temporary injunction of the consummation of the plan.

The Vulcanus Forging Co., of Cleveland, is shipping a car of ship rivets to New York this week, and in the next ten days will ship four more. The company's bolts and upsetting departments are so filled with orders that it will be unable to accept any new orders before Jan. 1, 1903. It has three of the largest buildings at the St. Louis Fair and must get all of this work out before Jan. 1, 1903.

SIXTEEN-INCH PLAIN CRANK SHAPER.

The complete destruction by fire of all patterns covering the line of shapers manufactured by the American Tool Works Co., of Cincinnati, furnished the opportunity for radical changes in the sizes as well as the detailed designs of the machines comprising the new line. The former line of shapers embraced the 15-inch, 17-inch and 21-inch crank, 16-inch back-geared crank, 26-inch and 28-inch triple geared. The new shapers will appear as 16-inch plain crank, 16-inch, 18-inch, 21-inch and 25-inch back geared crank and 26-inch and 30-inch triple geared.

The first of these to be brought to completion are the 16-inch plain crank and the 16-inch back-geared crank shapers. We illustrate in the accompanying engraving the completed machine. This shaper is heavier and stronger than its predecessor. The column, base, ram and table have all been made of greater dimensions and weight, thus giving additional power and capacity to the machine, yet retaining its well proportioned and compact appearance. The stroke is positive and has five rates of speed. Its length may be changed at will without stopping the machine, and the index shown in the cut facilitates the setting of the stroke to the length desired. The rocker arm is pivoted near the base line, and this gives the ram an almost uniform rate of speed its entire stroke and provides a very quick return. The rocker arm is of double section permitting a 2½-inch shaft to be passed under the ram through the hole shown in the top of column, for key-seating. This machine operates with convenience and smoothness, is susceptible of fine and positive adjustments while in full operation, and is thus especially adaptable to tool room work.



SIXTEEN-INCH PLAIN CRANK SHAPER.

The Bradford Gas Engine Co., Bradford, Pa., and the Flickinger Iron Works, of Cochranton, Pa., have been consolidated and will hereafter be known as the Flickinger Iron Works. The plant at Cochranton will be abandoned and in the future all of the works of the company will be done in Bradford. The buildings will be enlarged and the present output doubled.

A 1,200 H. P. GAS-DRIVEN BLOWING ENGINE.

In a recent issue of *Engineering* is an illustrated description of a 1,200 h. p. gas-driven blowing engine constructed by the Société Anonyme John Cockerill, of Seraing, and said to be the most powerful of its class. The two motor cylinders are arranged tandemwise. By this arrangement the advantages of a 2-stroke cycle are obtained as regards regularity of running, while the simplicity of design and fewness of parts characteristic of 4-stroke cycle motors are not foregone. Another important advantage of the tandem disposition is that the strains on the working parts are no greater than those due to a single cylinder, while the power developed is double. The gas is ignited by means of an electric coil, and a small electric motor is used for starting the engine. The blowing cylinder, besides the usual suction and delivery valves, is provided with a series of larger valves at each end, which open automatically to give greater ease in starting, or to allow of the volume of air being reduced when its pressure rises beyond certain limits. The gas cylinders are 1.300 meters (51 in.) diameter by 1.400 meters (55 in.) stroke. The air cylinder has a diameter of 1.850 meters (72¾ in.). The engine runs at a speed of 80 revolutions per minute, at which it can supply about 20,000 cubic feet of air at the atmospheric pressure; but the pressure can rise to 2¼ atmospheres absolute. The total weight of the engine, including the flywheel, which weighs 33 tons, amounts to about 237 tons.

Iron and Steel, Coal and Coke Blue Book.

The "National Iron and Steel, Coal and Coke Blue Book," a blue cloth bound volume of 669 pages, 6½x8¼ inches, has been published recently by R. L. Polk & Co., of Pittsburg. It contains a list of blast furnaces, steel works, rolling mills, bridge works and other manufacturers of iron and steel products, 561 concerns appearing in this list. In the portion of the book devoted to coal and coke an alphabetical list appears of coal operators and coke manufacturers, with names of officers, purchasing agents, sales managers and superintendents. Of the 669 pages about 200 contain advertisements. The price of the book is $7.50.

THE WORCESTER MACHINISTS' STRIKE.

WORCESTER, Mass., June 10.—It is now three weeks since the beginning of the strike in Worcester machine shops. The trouble had been brewing for some time and it came after many years of industrial peace and relations of mutual respect between employers and men. The machinists' union sent to the various firms without any explanation a form of agreement which would have bound the manufacturers to a nine-hour day; a 12 percent increase in pay—in other words a nine-hour day with pay for 10 hours; one apprentice to every five machinists and a four-year period for the apprentice. The employers could not recognize the union, and the men in the belief that the pressure of work would gain them their point concentrated upon two of the largest employers of labor in the city.

Combination by the men was met by an association of employers. The unwillingness of union men in other shops to handle work coming from a struck plant soon brought about sympathetic action elsewhere. In no instance, however, did this do more than cripple the local shops, nor has it involved the entire shut down of any of the machine shops. The firms chiefly affected have been Prentice Bros. and F. E. Reed & Co. Under normal conditions the former employs in the neighborhood of 275 men and the latter firm 300. About 160 men struck work at the Prentice plant and 140 at the other works. The number at work has been frequently increased by accession from the strikers' ranks and a few have come to the city for employment. Firms, in the belief that the strike might come to an end any day, have made no special effort to get employes in other fields.

Among the remaining firms directly affected are the Woodward & Powell Planer Co., who have had 20 men on strike out of a usual force of from 80 to 100, and the Whitcombe Mfg. Co., which has 17 men out. The Draper Machine Co., Lafayette Robbins, Marcus Mason & Co., H. C. Fish & Co., and P. Blaisdell & Co. are even less seriously affected.

There is an important difference between the situation at the shops of the Prentice Bros. and F. E. Reed & Co. At the latter plant but two of the gang bosses left with the men and but one of these held a position in which he could not be easily replaced at short notice. At Prentice Bros.' the gang bosses went out with their shopmates. Within a day or two some of these had a meeting with E. W. Whitmore, treasurer of the company, at his residence and others conferred with the management yesterday in regard to re-employment. These meetings are probably preliminary to an attempt at terminating the strike but there is no present anticipation of any compromise by the employers. A careful study of the situation indicates that the conditions may change totally before this letter appears in print. The men have found that the firms are not being seriously pressed by their customers for machinery, that many contracts have a strike clause, and lastly, they are finding that the firms with whom they have had over a generation of peaceful relations, are not necessarily "grinding monopolies," but are now, as in the past, disposed to kindly and considerate conference, even at this advanced stage of the proceedings. C.

Boiler Manufacturers' Convention.

H. J Hartley, chairman, and Frederick R. Case, secretary, of the local committee at Philadelphia, announce that the annual convention of the American Boiler Manufacturers' Association will be held at Atlantic City in the week of Monday, July 21. The headquarters will be at the Palace Hotel. The program of topical questions and of entertainment will be announced later.

A strange feature of the situation is the prices asked for new vessels. Numerous berths in the lake yards will soon be idle, and it was expected that the builders would be offering inducements on orders for next spring's delivery, but the prices they are quoting on ships of 5,000 to 6,000 tons capacity are $7,000 to $10,000 above the prices charged for vessels of the same kind that have lately been going into commission. High prices for material and uncertainty as to delivery are referred to as causes for the increased prices on new ships.—[Marine Review.

AMALGAMATED ASSOCIATION WAGE QUESTIONS.

The adjustment of the footnotes of the bar iron scale as made in conference between the Republic Iron & Steel Co. and the Amalgamated Association is not entirely satisfactory to the American Steel Hoop Co, and a conference was held in Pittsburg on Saturday, June 7. Nothing was done, however, and it was decided to hold a meeting later when some notes can be inserted that will have a direct bearing on improved mills of the American Steel Hoop Co.

On Friday and Saturday, June 13 and 14, a conference will be held in Pittsburg between the American Sheet Steel Co. and the scale committee of the Amalgamated Association for the purpose of adjusting the footnotes of the sheet scale. The date for a conference with the American Tin Plate Co. has not yet been arranged. The scale conference between the American Tin Plate Co. and the Tin Plate Workers' International Association convened at New York on Friday, June 6, and as yet no decision has been reached. The men are asking for an advance of 8 percent.

Owing to the activity of the Amalgamated Association during the past six months many independent mills heretofore operating non-union will be asked to sign the Amalgamated scale on July 1. It is estimated that fully a dozen mills will then come under the jurisdiction of the Association that have heretofore operated non-union. No trouble is feared, however, as the majority of the companies have already signified their willingness to sign the scale. The Wayne Iron Works, of Pittsburg, is the first of the independent mills to sign the bar iron scale for 1902-1903.

The New Thomas Furnace Started.

Furnace No. 3 of the Thomas plant of the Republic Iron & Steel Co., Thomas, Ala., was blown in last week in the presence of a large number of officials of the company. It was designed by S. V. Huber & Co., of Pittsburg. The furnace is 85 feet high, 18 feet 6 inches bosh diameter and 12 feet at the hearth. It will have a daily capacity of about 250 tons. There are 12 6-inch tuyeres placed 8 feet above the level of the hearth. Two sets of copper blocks are to be found above the mantel, while below the mantel is a set of cast iron cooling plates, 4 feet high inside of a steel jacket, which extends down within 4 feet of the center of the tuyeres. The tuyere jacket is of cast iron, and above this is another set of copper cooling plates. The hearth jacket is 8 inches thick and 10 feet high and is cast iron. The cast house is 215 feet long and 90 feet wide.

The furnace is provided with two 6-foot down-comers which connect to a dust catcher 18 feet in diameter by 40 feet high. The dust catcher is connected by a 6-foot main to a gas washer 20 feet in diameter and 40 feet long. The four Massicks and Crooke hot blast stoves are 22 feet in diameter and 85 feet high. There are eight batteries of Wheeler boilers, each of 400 h. p. The furnace has two cross compound, steeple type, blowing engines. The high pressure cylinders are 42 inches in diameter and the low 80 inches. The air cylinder is 84 inches in diameter and all have a stroke of 60 inches.

In the pumping station in the next building is a Wheeler condenser with wet and dry vacuum pump. There are two compound, duplex plunger pumps to feed the boiler and a 3,000-horsepower Cochrane feed water heater. Three compound, duplex plunger pumps, each with a capacity of 3,000,000 gallons of water in 24 hours, pump to the standpipe.

The postponement of the St. Louis exposition to 1904 is now before Congress as an item in the Sundry Civil bill. There is no opposition to postponement and it is believed that Congress at this session will enact the necessary legislation to provide for dedication ceremonies on April 30, 1903, and for the opening of the exposition on May 1, 1904.

The Bicycle Garden Plow Co., of Jackson, O., recently incorporated for the purpose of manufacturing garden plows and cultivators, are in the market for machinery to equip their plant, consisting of drop hammers, punch and shear, wood working machinery, metal wheel machinery, shafting, pulleys, etc.

PRODUCTION OF IRON ORE IN 1901.

The production of iron ores in the United States during the year 1901, as given by Mr. John Birkinbine in Mineral Resources of the United States, 1901, now in press, United States Geological Survey, David T. Day, Chief of Division, amounted to 28,887,479 long tons, as compared with 27,553,161 long tons in 1900, a gain of 1,334,318 long tons, or 5 percent; the gain of 1901 over 1898 was 9,453,763 tons, or 49 percent, a phenomenal growth. The total value at the mines of the ore mined in 1901, as reported to this office, was $49,256,245, or a mean value of $1.71 per ton, an apparent decrease of 71 cents, or 29 percent, from the 1900 figures of $2.42 per ton. The value of the iron ores mined in 1900 was $66,590,504. The largest amounts of iron ores officially reported to date, from any other countries, are 18,667,950 long tons, mined in Germany and Luxemburg in 1900, and 18,031,957 long tons mined in Great Britain in 1882.

Twenty-five states and one territory mined iron ore in the year 1901, the number of producing states remaining the same as in 1900, Utah dropping out and South Carolina taking its place. As in the year 1900, Minnesota contributed the greater portion of the increase for 1901, and advanced to first place as a producer, Michigan, which has uninterruptedly occupied this position since the year 1881, now being second.

New exploitations for standard ores in the Lake Superior district are being actively carried on, and in addition, some siliceous and lower grade ores, of which large quantities exist, are liberally exploited. In the central west, valuable deposits of iron ore in Wyoming, Colorado, and New Mexico are being worked extensively to supply the Colorado furnaces. On the Pacific Coast, the Irondale furnace in Washington has resumed operations, but its principal reliance so far has been on the magnetite deposits of Texada Island, in British Columbia.

In 1901 the red hematite mines contributed 24,006,025 long tons, or 83.10 percent of the total for the United States, an increase of 6 percent over the 1900 total. Minnesota was the largest producer of this class of ore, followed by Michigan and Alabama. The total brown hematite mined was 3,016,715 long tons, or 10.44 percent of the output of the country, a decrease of 7 percent from the 1900 record. Virginia and West Virginia, combined, lead as a brown hematite producer, followed by Alabama, and Tennessee. Of magnetic ores, 1,813,076 long tons, or 6.28 percent of the United States total, were mined in the year 1901, an increase of 18 percent over the total for 1900. Pennsylvania was the principal contributor, followed by New Jersey and New York. Only 51,663 long tons of carbonate iron ore was mined in 1901, being 0.18 percent of the total iron ore output for the year. Practically all of this came from Ohio, although Maryland, New York, and Pennsylvania contributed small amounts.

In the 13 years since the year 1889, when the United States Geological Survey began collecting the statistics of the amounts of the different classes of iron ore mined, the red hematites have contributed 180,551,909 long tons, or 76.85 percent of the total; the brown hematite mines, 30,945,504 long tons, or 13.17 percent; the magnetic deposits, 21,524,693 long tons, or 9.16 percent; and the carbonate ores, only 1,926,668 long tons, or 0.82 percent of the total.

The greater part of the iron ore in the United States continues to be supplied by the Lake Superior region, which produced its maximum output of 21,445,903 long tons in 1901, being 74 percent of the total quantity reported and an increase of 4 percent over the total for 1900. The Marquette range, in the state of Michigan, from which ore was first taken in 1856, has contributed, up to date, 62,847,473 long tons. Most of this ore is shipped from the ports of Marquette and Escanaba. The Menominee in the states of Michigan and Wisconsin, was the second range to be opened in 1877, and it has contributed to date, 37,621,428 long tons, the greater portion being shipped from Escanaba and a small amount from Gladstone. The Gogebic range, in the states of Michigan and Wisconsin, and the Vermilion range in Minnesota began shipping in 1884, the Gogebic range having shipped to date 34,154,790 long tons from the ports of Ashland and Escanaba, and the Vermilion range having shipped to date 16,977,243 tons from the port of Two Harbors. The Mesabi range in Minnesota began shipping in the year 1894, and has shipped thus far a total of 40,404,967 long tons, and has now apparently greater resources of ore than any of the older ranges. In 1901 this range produced 9,303,541 tons, or 32 percent of the total for the United States. A sixth range was opened in Canada in the year 1900, the ore being shipped principally to the United States from the port of Michipicoten in the Province of Ontario, and the total output to the close of 1901 amounted to 284,679 tons.

From the above it appears that in the year 1901 the Mesabi range ranked first, producing its maximum output of 9,303,541 long tons, a total that has never been reached by any other iron ore region in the world, the Billboa district in Spain being its closest competitor.

Taking the states in the order of their production we find that Minnesota contributed 11,100,537 long tons, or 38 percent of the total for the United States, and is easily entitled to first place. In fact, with the exception of the German Empire and Great Britain, no country in the world has reached so great a total in any year as the state of Minnesota in 1901, and this phenomenal product exceeded by 3,989,175 long tons the production of iron ore of all the mines combined, as reported by the tenth census of the United States in 1880. Michigan ranks next, with a total of 9,654,067 long tons of iron ore, a decrease of 3 per cent from the total for 1900. Alabama ranks third, with a production in 1901 of 2,801,732 long tons, with nearly 10 percent of the total. Pennsylvania regained fourth place, contributing 1,040,684 tons, an increase of 19 percent over the state total for 1900. Virginia and West Virginia, combined, ranked fifth, mining 925,394 tons, an increase of nearly 4 percent over their total for 1900. Tennessee increased her output 33 percent over the total of 1900, and ranked sixth with 789,494 tons. Wisconsin came seventh, with 738,868 tons. New York was eighth, with 420,218 tons, a decrease of 5 percent over the state total of 1900. Colorado ranked ninth, with a total of 404,037 tons, a decrease of nearly 1 percent from the state production of 1900. Some of the Colorado ores carry enough silver to make them valuable on that account, and therefore they are not included in this report. New Jersey came tenth, with 401,989 tons, an advance of 17 percent upon the 1900 output. Georgia and the two Carolinas together contributed 215,599 long tons of iron ore; and none of the remaining states, except Wyoming, produced over 100,000 tons of iron ore.

Valley Blast Furnace Strike Ended.

The strike of the blast furnace workers in the Mahoning and Shenango Valleys was settled on Friday, June 6, the men receiving an advance in wages amounting of 10 percent. The terms of the settlement provide for an advance of 10 percent for all blast furnace workers outside of common laborers and a continuation of the 12-hour system. The common laborers have their day reduced from 10 hours to nine at the old wages of $1.50 per day. It was also provided that no man should lose his position on account of his connection with the strike. These conditions were accepted by all the operators with the exception of the Shenango Furnace Co., Sharpsville, Pa., who refused to take back the ringleaders in the strike. For a time it seemed as if there would be trouble at these furnaces, but sufficient men have been secured to insure their operation. The blast furnace workers have submitted to a referendum vote the question whether all should strike again to compel an adjustment of the trouble at the Shenango Furnace Co.'s plant. . .

The American Steel Hoop Co. and the National Steel Co., which have maintained sales offices for several years in London, have decided to discontinue these offices. The headquarters of both companies have been closed and will not be reopened again. As is well known the selling operations of both companies are now carried on through the Carnegie Steel Co. organization.

The Commonwealth Steel Co. has just finished the foundations for all of its buildings at St. Louis and steel is now on the ground for the power house and engine house. The plant will be in full operation by Oct. 1.

AMERICAN SECTION INTERNATIONAL ASSOCIATION FOR TESTING MATERIALS.

The fifth annual meeting of the American Section will be held at Atlantic City, N. J., on Thursday, Friday and Saturday, June 12, 13 and 14, 1902. The headquarters will be at the Hotel Traymore, where all sessions will be held. The first session will be a business meeting following the annual address of the chairman. The second, third, fourth and fifth sessions will be devoted respectively to the consideration of specifications, steel, cement, and cast iron. The third, or cement session, which will be held on Friday evening, will be in the form of an "engineering smoker."

First Session, Thursday, June 12, 8. p. m.

1. Reading of the minutes of the fourth annual meeting.
2. Annual address by the chairmar.
3. Annual report of the executive committee.
4. Miscellaneous business.
5. Election of officers.

Second Session, Friday, June 13, 10 a. m.

6. Report of the American branch of Committee No. 1.

7. Summary of the American and foreign comments on the standard specifications for steel adopted by the American Section. Albert Ladd Colby.

8. Discussion of the following modifications (shown in italics) in the standard specifications for steel rails (adopted by the American Section), embodied in the specifications for steel rails adopted by the American Engineering and Maintenance of Way Association, at the annual meeting in Chicago, March 18, 19, 20, 1902.

(a) Drop Test.—One drop test shall be made on a piece of rail not more than six feet long from *every* blow of steel. The test piece shall preferably be taken from the top of the ingot. The rail shall be placed head upwards on the supports, and the various sections shall be subjected to the following impact tests:

45 to and including 55	15
More than 55 to and including 65	16
More than 65 to and including 75	17
More than 75 to and including 85	18
More than 85 to and including 100	19

If any rail break when subjected to the drop test, two additional tests will be made of other rails from the same blow of steel, and if either of these latter tests fail, all the rails of the blow which they represent will be rejected, but if both of these additional test pieces meet the requirements, all the rails of the blow which they represent will be accepted.

(b) Heat Treatment.—*The number of passes and speed of train shall be so regulated that on leaving the rolls at the final pass the temperature of the rail will not exceed that which requires a shrinkage allowance at the hot saws of — inches for 85-pound and — inches for 100-pound rails, and no artificial means of cooling the rails shall be used between the finishing pass and the hot saws.*

(c) Length of Rails.—The standard length of rails shall be *thirty-three* feet. Ten percent (10%) of the entire order will be accepted in shorter lengths, varying by even feet down to *twenty-seven* feet (27′). A variation of one-fourth of an inch (¼″) in length from that specified will be allowed.

The corresponding clauses in the Standard Specifications adopted by the American Section, are as follows (all differences are shown in *italics*):

(a) Drop Test.—One drop test shall be made on a piece of rail not more than six feet long, selected from every *fifth* blow of steel. The rail shall be placed head upwards on the supports and the various sections shall be subjected to the following impact tests:

45 to and including 55	15
More than 55 to and including 65	16
More than 65 to and including 75	17
More than 75 to and including 85	18
More than 85 to and including 100	19

If any rail break when subjected to the drop test, two additional tests will be made of other rails from the same blow of steel, and if either of these latter tests fail all the rails of the blow which they represent will be rejected, but if both of these additional test pieces meet the requirements, all the rails of the blow which they represent will be accepted. *If the rails from the tested blow shall be rejected for failure to meet the requirements of the drop test as above specified, two other rails will be subjected to the same tests, one from the blow next proceeding, and one from the blow next succeeding the rejected blow. In case the first test taken from the preceding or succeeding blow shall fail, two additional tests shall be taken from the same blow of steel, the acceptance or rejection of which shall also be determined as specified above, and if the rails of the preceding or succeeding blow shall be rejected, similar tests may be taken from the previous or following blows, as the case may be, until the entire group of five blows is tested, if necessary.*

The acceptance or rejection of all the rails from any blow will depend upon the results of the tests thereof.

(b) Heat Treatment.—*No test specified.*

(c) Length of Rails.—The standard length of rails shall be *thirty* feet (30′). Ten percent (10%) of the entire order will be accepted in shorter lengths varying by even feet down to *twenty-four* feet (24′). A variation of one-fourth of an inch (¼″) in length from that specified will be allowed.

9. Topical discussion on the question: "Is is Desirable to Specify a Single Grade of Open-Hearth Structural Steel for Bridges of Ordinary Spans?" Messrs. A. P. Boller, Theodore Cooper, J. E. Greiner, John McLeod, C. C. Schneider, J. P. Snow and others will participate in this discussion.

10. Reports of American branches of international committees on all subjects other than those relating to cement and cement mortars.

11. Reports of committees of the American Section.

17. Miscellaneous business.

Third Session, Friday, June 13, 3 p. m.

13. Finishing Temperature and Structure of Steel Rails. Albert Sauveur.

14. Rail Temperatures. S. S. Martin.

The discussion of the above papers will be opened by Messrs. Robert Job and P. H. Dudley.

15. The Relation Between the Basic Open-Hearth Process and the Physical Properties of Steel. C. B. Dudley.

16. The Ethics of Testing. P. Kreuzpointner.

Fourth Session, Friday, June 13, 8 p. m.—"Engineering Smoker."

18. The Correlation of Cement Specifications. R. W. Lesley.

19. The Advantages of Uniformity in Methods of Testing and Specifications for Cement. G. S. Webster.

The discussion of the above papers will be opened by Mr. W. A. Aiken.

20. The Chemical Analysis of Cement: Its Possibilities and Limitations. R. K. Meade.

The discussion will be opened by Mr. Clifford Richardson.

21. Cement Testing in Municipal Laboratories. R. L. Humphrey.

22. Tests of Reinforced Concrete Beams. W. K. Hatt.

23. Reports of the American Branches of International Committees on Cement and Cement Mortars.

24. Miscellaneous business.

Fifth Session, Saturday, June 14, 10 a. m.

25. Notes on the Constitution of Cast Iron. Henry M. Howe.

26. Effect of Variations in the Constituents of Cast Iron. W. G. Scott.

Papers 25 and 26 will be discussed jointly.

27. Present Status of Testing Cast Iron. R. G. Moldenke.

28. The Need of Foundry Experience for the Proper Inspection and Testing of Cast Iron. Thomas D. West.

29. A Quick Foundry Contraction Test for Metals. Asa W. Whitney.

Papers 27, 28 and 29 will be discussed jointly.

30. High Strength of White Iron Castings as Influenced by Heat Treatment. A. E. Outerbridge.

31. Digest of Current Specifications for Cast Iron Pipe. Walter Wood.

32. Miscellaneous business.

PERSONAL.

G. A. Cragin, assistant general sales agent of the American Steel & Wire Co., at Chicago, has been transferred to the Worcester, Mass., offices, and G F. Rummel, formerly in the manufacturers' department at Chicago, has been appointed to succeed him.

O. P. Letchworth, president of the Pratt & Letchworth Co., Buffalo, returned this week from a European trip of several months.

John W. Gates sails for Europe on June 25.

Henry Penton has resigned as general manager of the Allis-Chalmers works at Chicago, and is succeeded by J. C. Niedermeyer, formerly of the Buffalo Engineering Co.

H. S. Waite has succeeded T. M. Livesay as secretary of the Case Mfg. Co., Columbus, O., the change taking effect May 20.

E. F. Du Brul, of the Miller, Du Brul & Peters Mfg. Co., Cincinnati, first vice president of the National Metal Trades Association, has been made acting commissioner of the latter organization, Victor H. Olmsted having resigned as commissioner and secretary. The office of the association has been transferred from 95 Liberty St., New York, to Room 50, Mitchell Building, Cincinnati.

An interesting phase of the recent movement for the adoption of the latest American ideas and practice in Great Britain is the increasing tendency to employ American engineers, both for special and for ordinary every day work. We have already noticed the fact that one of the American specialists [Frank C. Roberts, of Philadelphia] has been employed to reconstruct blast furnaces at the Consett, Cleveland, and Dowlais works on American lines, and that Mr. Axel Sahlin has succeeded at Askam in building a furnace on kindred lines which has turned out over 300 tons a day on a 45 percent to 48 percent ore. Mr. Sahlin, of course, is an engineer whose main experience has been gained in the United States, although he is of Swedish origin. The new blast furnace manager of the Dowlais and Cardiff-Dowlais furnaces is Mr. Arnold D. Reece, who was formerly manager of the blast furnaces at Lebanon and at Sparrow's Point, near Baltimore, and who is understood to have been engaged for a term of years at a salary of £3,000 a year, which, it may be noted, is a salary considerably in excess of the average paid to men so employed in the United States. The general manager of the Dowlais and of the Dowlais-Cardiff works is now Mr. Wm. Evans, formerly of the Cyfarthfa works, and still in chief control of Cyfarthfa, since there works were acquired by Guest, Keen & Co.—[London Iron and Coal Trades Review.

J. O. Emanuel Trotz, a young Swedish engineer, who until recently has been identified with the American Steel & Wire Co., at Worcester, Mass., has been appointed metallurgical adviser to President Charles M. Schwab, of the United States Steel Corporation. Mr. Trotz came to this country in 1887 to further his studies and became associated with the Washburn & Moen Co. He is the first to fill this new position.

John F. Ward, one of the district vice presidents of the Amalgamated Association with headquarters at Youngstown, O., has been appointed deputy workshop inspector for Ohio.

W. B. Lange, a manufacturer of machine tools at Johnstone, Scotland, was in Pittsburg last week, visiting the industrial plants in that district.

W. C. Allison has resigned his position as manager of the Niles Car & Mfg. Co., Niles, O. He retains his interest in the company and also continues as a director.

E. F. Wood, who recently resigned as assistant superintendent of the Homestead plant of the Carnegie Steel Co., has been elected vice president of the International Nickel Co., with headquarters in New York.

Reuben Miller, president of the Crucible Steel Co. of America, left Pittsburg last week for his country seat at Lake Muskota, Ont. He will spend the greater part of the summer there.

John McConnell, who recently resigned as superintendent of the steel plant of the Tennessee Coal, Iron & Railroad Co., Birmingham, Ala., was presented with a diamond stud by the heads of departments on the eve of his departure.

Paul McCaslin, superintendent of the Warren, O., plant of the American Steel Hoop Co., has been appointed superintendent of the Ironton, O., plant of the Republic Iron & Steel Co.

Employes of the Republic Iron & Steel Co., Chicago, have chosen Charles E. Graves, Ralph P. Zint and P. G. Maitland as a committee of trustees for the stock of the company purchased by them in accordance with their profit sharing plan.

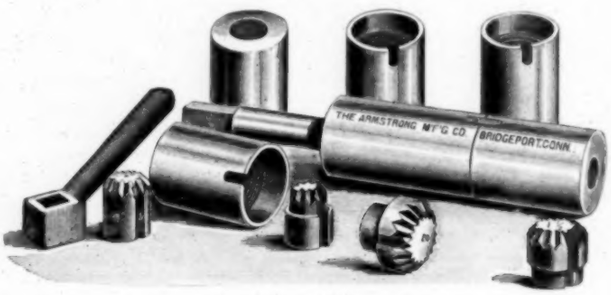
Harry Green, chief electrician of the Valley plant of the Republic Iron & Steel Co., Youngstown, O., has resigned to accept to a similar position with the American Rolling Mill Co., Muskegon, Mich.

Edward Shearson, comptroller of the United States Steel Corporation, who resigned on June 1, has been succeeded by William Filbert, assistant comptroller.

Wm. G. Clyde, formerly at the South Works of the Illinios Steel Co., and more recently manager of sales for the American Steel Hoop Co. at Philadelphia, has been transferred to the Cleveland offices of the Carnegie Steel Co. He will sell the products of the Carnegie group of companies in the United States Steel Corporation.

NEW ARMSTRONG NIPPLE HOLDER.

A new nipple holder has been manufactured by the Armstrong Mfg. Co., of Bridgeport, Conn., to be used in connection with its No. 00 pipe threading machine. It holds pipe from 1 to 4 inches inclusive by using different threaded rings and backing pieces. It will also hold close nipples either right hand or left hand, no change of parts being necessary to hold the nipple for threading it left hand. When the thread is cut



NEW ARMSTRONG NIPPLE HOLDER.

the nipple can be removed with the fingers by loosening the screw in the back of the holder. This nipple holder can be furnished to hold as small as ¾ inch if required.

New Officers of Crucible Steel Co. of America.

At a meeting of the directors of the Crucible Steel Co. of America held at Pittsburg last week there was a complete reorganization of the official board. C. H. Halcomb retired as president and member of the executive committee and it is reported that he intends going into the steel business in the East. The officers are now as follows: Reuben Miller, president; Frank B. Smith, assistant president and general manager; Benjamin Atha, first vice president; Robert E. Jennings, second vice president; James H. Park, third vice president; Charles E. Clapp, fourth vice president. No secretary has yet been elected, but H. N. Babcock has been appointed assistant secretary. Julius Bieler was elected treasurer and John Neeley, assistant treasurer. The new executive committee is composed of the following gentlemen: R. Miller, A. W. Mellon, Frank B. Smith, Benjamin Atha, R. E. Jennings, and James H. Park. A meeting of the Clairton Steel Co., one of the subsidiary companies of the Crucible Steel Co. of America, was held the same day and officers were elected as follows: W. P. Snyder, president; Frank B. Smith, vice president; Julius Bieler, treasurer. The executive committee consists of W. P. Snyder, R. E. Jennings, James H. Park, Reuben Miller, A. W. Mellon, and Frank B. Smith. The new charter for the Clairton Steel Co., which will take over the St. Clair Steel Co. and the St. Clair Furnace Co., was granted by the State of Pennsylvania last week. At the same time a charter was granted for the St. Clair Limestone Co., which will be a subsidiary interest of the Clairton Steel Co.

The Foundrymen's Association.

The 119th meeting of the Foundrymen's Association was held at the Manufacturers' Club in Philadelphia on Wednesday evening, June 4, with a good attendance of members. The president, Thos. R. Rankin, occupied the chair. The following were present: Thos. I. Rankin, Abram Cox Stove Co., Philadelphia; Jas. S. Stirling, Harlan & Hollingsworth, Wilmington, Del.; P. D. Wanner, Reading Foundry Co., Reading, Pa.; Thos. Furlow, Furlow Sanitary Brass Mfg. Co., Philadelphia; W. O. Steele, Gregor Mfg. Co., Philadelphia; Dr. Alfreda Gorni, Milan, Italy; Enrico Vigano, Milan, Italy; G. H. Judy, Pressed Steel Car Co., McKees Rocks, Pa.; C. D. Matthews, Camden Iron Works, Camden, N. J.; Geo. C. Davis, chemist, Philadelphia; H. B. Lincoln, Jas. Smith Woolen Machinery Co., Philadelphia; Horace E. Setchell, W. P. Cunningham, C. C. Hunsberger, D. M. Kittinger, A. & P. Roberts Co., Pencoyd, Pa.; Jas. B. Strain, Robt. Wetherill & Co., Chester, Pa.; Wm. Devlin and H. O. Evans, Thos. Devlin & Co., Philadelphia; F. Sabin, North Wales Foundry, North Wales, Pa.; F. E. Cook, Westinghouse Air Brake Co., Wilmerding, Pa.; H. E. Pierce and Fred Stahl, Girard Iron Works, Philadelphia; Geo. A. Messick, Pusey & Jones Co., Wilmington, Del.; H. L. Haldeman, Pulaski Iron Co., Philadelphia; Frank Etting and F. C. Price, E. J. Etting Co., Philadelphia; W. J. W. Moore, Pilling & Crane, Philadelphia; J. S. Hibbs, J. W. Paxson Co., Philadelphia; Josiah Thompson, J. Thompson & Co., Philadelphia; Dr. Edw. Kirk, Philadelphia; Geo. Benkirt, G. Rebman & Co., Philadelphia; Godfrey Lukehart, Cohocksink Brass Foundry, Philadelphia; Jas. L. Keightley, Geo. V. Cresson Co., Philadelphia; J. Hy. Pepper, *The Iron Trade Review*, Philadelphia; A. A. Miller, *Iron Age*, Philadelphia; Oregon J. Ward, Howe Scale Co., Philadelphia; Edw. Hitzeroth, C. Hitzeroth, Philadelphia; T. B. Harkins, Harkins Foundry Co., Bristol, Pa.; D. H. Redmond, Philadelphia; Stanley G. Flagg, Jr., S. G. Flagg & Co., Philadelphia; Howard Evans and A. G. Warren, J. W. Paxson Co., Philadelphia.

The secretary read an invitation from the secretary of the American Foundrymen's Association, Dr. Richard Moldenke, inviting the members of the Philadelphia organization to the Boston convention, June 17-19.

P. D. Wanner presented the papers covering the granting of the charter of incorporation of the association.

J. Wesley Pullman, of Philadelphia, was a candidate for membership, and by a unanimous vote was elected.

A letter was read from Antonio C. Pessano, of the George V. Cresson Co., Philadelphia, and chairman of the executive committee of the association, resigning his office. This action was due to his removal from Philadelphia to become president and general manager of the Great Lakes Engineering Works, Detroit. Mr. Pessano's resignation was accepted with regret. J. S. Stirling referred to the great interest Mr. Pessano had always taken in association affairs and said that the resignation could not be accepted without comment. He therefore moved that a committee of three be appointed to prepare a suitable resolution conveying the regret of the association that so valuable an officer should be lost to them and the best wishes of the association for his success in his new field. Messrs. Stirling, Wanner and Devlin were appointed such committee and later presented the resolution which was passed and ordered to be engrossed and forwarded to Mr. Pessano.

P. D. Wanner read the following paper on

"How Many Hours Shall Constitute a Day's Work?"

This is a question that will not down but comes up again and again, like the ebb and flow, unceasingly. Shall it be eight, nine, or ten hours? By a general consensus of opinion in this country ten hours have come to be regarded as an average or commonly accepted day's work, in the store, the shop, mine and on the farm, for quite a number of years; but within late years the so-called laboring element by their leaders have made a strenuous effort to force the working day down to eight hours and in order to make the greatest headway possible they applied to the law makers in Congress and the several Legislatures of the States and municipalities. Their appeals and threats were generally successful against these people who were in a great measure indebted for their position to this large class of the voting community. With this weapon in their hands they could and did enforce an eight-hour day for the Government, the State and the municipality. Beyond that, however, they could not go without having a penalty inserted in the Act limiting the hours of daily service of laborers and mechanics employed upon work done for the United States, or any territory, or the District of Columbia. The House bill known as the eight-hour law was passed May 20, 1902, and reads as follows:

"Be it enacted * * * that each and every contract hereafter made to which the United States, any territory or the District of Columbia, is a party, and every such contract made for or on behalf of the United States or any territory or said District, which may require or involve the employment of laborers or mechanics, shall contain a provision that no laborer or mechanic doing any work contemplated by the contract in the employ of the contractor or any sub-contractor contracting for any part of said work contemplated, shall be required or permitted to work more than eight hours in any one calendar day. And each and every such contract shall stipulate a penalty for each violation of the provision directed by this act of $5 for each laborer or mechanic, for each and every calendar day in which he shall labor more than eight hours; and any officer or person designated as inspector of the work to be performed under any such contract, or to aid in enforcing the fulfillment thereof shall, upon observation or investigation, report to the proper officer of the United States or any territory or the District of Columbia, all violations of the provisions in this act directed to be made in each and every such contract, and the amount of the penalties stipulated in any such contract shall be withheld by the officer or person whose duty it shall be to pay the moneys due under such contract, whether the violation of the provisions of such contract is by the contractor, his agent or employes or any such sub-contractor, his agents or employes. No person on behalf of the United States, or any territory, or the District of Columbia, shall rebate or remit any penalty imposed under any provision or stipulation herein provided for unless upon a finding which he shall make up and certify that such penalty was imposed by reason of an error in fact."

This bill now goes to the Senate where a strong effort will be made to have it passed, and if passed, it is likely to be signed by the President. It will then go to the Supreme Court for a decision as to its constitutionality. In the meantime it will have the effect of bringing about a world of trouble and worriment to the contractors who may be fortunate or unfortunate enough to secure Government work. And should this act ever be declared constitutional it would be notoriously unjust and unfair to all others not fortunate enough to get employment within its jurisdiction.

There can, however, be no law enacted that will prevent any man from working just so long as he pleases or to have another one work for him as many hours as they may mutually agree upon for a day's work. I always felt that it was very unjust to make this distinction in favor of some of our people as against the great majority who must labor one hour, two, or three, longer, much harder and frequently for less pay, to satisfy the advocates or agitators of a shorter day. Neither have I been able to make up my mind that an eight-hour day is of sufficient length. I rather believe, however, that a compromise upon nine hours would be nearer right and more desirable than either the eight- or ten-hour day. Eight hours, in my opinion, do not seem in the great majority of vocations to be long enough. Our days are divided up into two parts, forenoon and afternoon. It strikes me that four and a half hours of work of almost any kind in the forenoon and afternoon would be short enough for all purposes of rest and recreation. I believe that this day would recommend itself generally and would have done so long before this but for the unreasonable eight-hour agitation.

The average man is by nature lazy and would rather not work at all if he could get his necessities and comforts without it. But without work we cannot secure our wants, much less our comforts or pleasures by which life is made worth living. Accumulated wealth, so called, is the surplus product of toil, and measures our prosperity and happiness; and just as wealth accumulates the possibilities of prosperity and happiness increase. Therefore, it follows that the more work we do or the longer the working day, the more wealth, the

greater the prosperity, the higher the wages and the greater the happiness of all our people. The highest wages are paid all the world over where there is the greatest amount of wealth or surplus product of labor; and by lessening that surplus you lessen the possibilities of all the real enjoyments of life. From this mode of reasoning I do not believe that an eight-hour day is desirable; no, not even to those who advocate it. They are not going to get what they are after, viz., less work and more pay. It is claimed that by the aid of our improved machinery, the general information and intelligence of the people at this time, that they can do so much more work in a given time than they could before. That is true, but on the other hand, see how their wants have increased, desire for pleasure and all the enjoyments of life. It is also claimed by this same class of agitators for less work and more pay, that the workers are not getting their fair share of profit out of the work they do. That may be so, always was and always will continue to be so as long as human nature remains the same, though this condition has been greatly mitigated by our advanced civilization and reduced almost to a minimum.

The talk about the wealth producers, as applied to the so-called working element at this time, is greatly misapplied. I rather believe, and without intending to be unfair to anyone, that those who, by their labor and intelligence, with the use of money or so-called capital, applied to the numerous and different industrial and commercial enterprises, are the real wealth producers everywhere. It is the lower strata that bear the upper, though it is the privilege of all to get into the upper; but all cannot succeed.

My sympathy has always been in favor of the under dog all my lifetime and will be so to the end, and in the face of the fact that it is the under dog that provokes the fight in nine cases out of every ten. The weak and the needy require our aid and comfort. What is best for them is best for others. If an eight-hour day, for instance, is not the best thing for those who advocate it, it would not be for those who oppose it. Then what would be best? Would it not be a nine-hour day? That, I believe, could be brought about by an almost general consensus of opinion, and if so, it should become the general working day, and all laws that have been passed heretofore in conflict should be repealed.

J. S. Stirling in discussing the paper said: "The manufacturers are not doing much talking, but they are thinking a good deal about this matter. We have been about the only establishment in Wilmington running a ten-hour day, but the question of supply and demand came in, and in running a ten-hour shop we found we could not get the class of men we should like. Most of them were incompetent and not at all zealous. We realized that in order to get men we should have to bring our shop conditions to about the same as those of other shops, and for that reason we made a voluntary abatement in the time and are now running on the nine-hour basis, hoping for better results. Personally I think the ten-hour day is past, but I do not think the eight-hour day has reached us."

A. G. Warren, of J. W. Paxson Co., Philadelphia, then read a paper, reproduced herewith, on

"The Paxson-Warren Sand Blast System."

The paper was illustrated by lantern slides and a collection of cleaned castings was on exhibition:

The sand blast process has been before the public for more than 30 years, but not until the last 10 years has it come into use in the foundry. Although not yet universally used, the merits of the sand blast are fast being recognized, and quite a number of plants have been installed during the past two years. The improvements made in air compressors, with the more general use of compressed air, have in a large measure been responsible for this. It is not until comparatively recently that there has been on the market an efficient American built sand blast machine. The machine itself should be strongly built to stand rough usage of unskilled labor. As damp sand will clog up any sand blast, hand holes should be so located that the obstruction can be removed at once without much trouble. I have seen where, with the double shell sand blast, it required fully an hour to remove some damp sand. The machine had to be disconnected and hung up by a hoist so that the sand could come out through the top. The Paxson-Warren system has a single shell with no inside hopper. All parts are accessible through hand holes and all parts liable to wear can be easily replaced. The valve at the top of the machine controls the air supply, the one at the bottom regulating the supply of sand. The sand is fed in through a valved opening in the top head which is closed when the machine is in operation. To operate, the air is turned on and the jet of sand and air directed against the casting to be cleaned. The air serves to give a high velocity to the sand which does the work. A specially designed helmet is used to protect the face of the operator. The most wear comes on the hose and nozzle. For hose we use a grade specially made. It is practically pure Para rubber and will last, with constant use, from six months to one year. Hose may be used up to 50 feet long; 12-foot lengths being long enough for most requirements. It has been found that hard iron tips and nozzles give the best satisfaction.

An important point not to be overlooked is the quality of sand which should be used in these machines. It should be hard and tough and not too fine, and thoroughly dried and cooled before using, so that it will not steam and clog up the machine. Care should be taken not to overheat the sand, for this will cause it to break up and a good deal of its efficiency is destroyed.

To avoid trouble, it is necessary to have a good air compressor. The idea that because only a low pressure is used, any machine will do, is a wrong one. As there are a number of first-class machines on the market, it is not necessary to mention any particular make. The compressor selected should have a confined suction, so that cold air can be supplied to it and thus avoid taking in more moisture than necessary. It is a well known fact that cold air carries less moisture in suspension than hot air. The receiver should be located near the sand blast in order to trap out any moisture that may condense in the pipe. Either a belt or steam driven compressor may be used, as best suits the power conditions of the plant. Where there is ample engine power available, it is best to use a belt driven compressor, because a large engine uses steam more economically than a small steam-driven compressor. The best place to locate the air compressor is in or near the engine room, so that the engineer can take care of it.

With the proper size of pipe, air can be conducted a long distance with very little loss in pressure. The number of cubic feet of free air required per minute will vary according to the opening in the nozzle and the pressure required to do the work. For brass casting ten pounds pressure is sufficient; on gray iron castings 15 to 20 pounds, is generally used; and for steel castings 25 to 30 pounds is required. Experience has proved that a large amount of air at a low pressure will do more work than a small amount at a high pressure. The sizes of openings in the nozzles commonly used are 3/16, 1/2, 5/8, 7/8 and 1/4-inch. Many of the compressor catalogues give the amount of air that will be discharged through different sized orifices at certain pressures. As the sand takes up some room it is obvious that the figures given will be ample for this service.

It quite frequently happens that an establishment having a high pressure air service already installed will consider the advisability of putting in a sand blast plant. One of the first questions arising is whether the high pressure air can be reduced. While this can be done it is not economical. Take, for example, a sand blast for cleaning gray iron castings, using air at 20 pounds pressure, through a half-inch nozzle. The amount of free air required would be about 120 cubic feet per minute. To compress this amount to 20 pounds, requires about 9 h. p. To compress the same quantity to 80 pounds would take about 23 h. p. As there is no power or advantage gained by reducing, there would be a loss of about 14 h. p., and the total loss for a year would amount to nearly the cost of a special compressor for this service.

As the sand blast makes a large amount of dust, it is customary in most cases to have it installed in a room by itself, of sufficient size and conveniently arranged to handle the work. In all cases I would strongly advise using an exhaust fan to take away the dust. The size of fan will vary according to the size of the room, size of sand blast and amount of dust to be exhausted. It is the best policy to install a large fan and run it at a medium speed, than to run a smaller fan at a high speed to do the same work. While the first cost may be a little

more, the difference will easily be made up by the horsepower saved. Where it is objectionable to exhaust the dust out of doors, it becomes necessary to install a washer that sprays the dust as it is drawn through, so that the exhausted air is practically clean. The dust settles to the bottom of the washer as mud and occasionally has to be shoveled out.

Where the sand blast is used on a large scale, it is an advantage to have an arrangement for preparing the sand so it can be used over again. In this case, a hopper is located in the center of the room, or to one side, and covered with a grating. The hopper discharges into an elevator boat from which it is elevated and fed into a revolving or oscillating screen, where the fine sand is screened out into a dust box and the tailings fall into the sand box, which is above the sand blast. From the sand box the sand is fed back into the sand blast as required. With this scheme the fine sand does not get into the washer or fan, consequently the washer does not have to be cleaned out as often. The belt elevator is a positive device and when it is properly fed gives good satisfaction. As the conditions in any two plants are never exactly alike, it requires considerable thought to get the best arrangement and one that will give the best satisfaction.

For cleaning large amounts of small castings, a sand blast tumbling barrel is used to advantage. Capacities of these barrels vary from 5 to 10 tons a day. The barrel mounted on rollers is filled less than half full and caused to revolve very slowly, say three or four revolutions per minute. The sand blast jets are introduced through the ends of the barrel, and as the barrel revolves, each casting comes in contact with the blast. The time required to clean one charge varies from 20 to 30 minutes. The advantage of this method is that the castings are thoroughly cleaned and the sharp corners preserved. The barrel itself is covered with a sheet iron casing which is connected to an exhaust fan and washer, if necessary.

In comparing the sand blast process with other methods of cleaning, it is unfair to make comparisons with methods where the castings are only half cleaned. In the bath tub business, the sand blast is almost an absolute necessity on account of the labor saved, and because it is the best way to prepare tubs for enameling. On castings to be machines there is a great saving on the tools in the machine shop. The sand blasted casting takes paint better and has a more finished appearance than a casting cleaned in any other way. In most cases where the sand blast is properly installed, it should pay for itself in two or three years. The sand blast is not confined to the foundry alone, but is extensively used for removing scale and rust from sheet iron and structural work; for cleaning brazed joints, and for cutting and cleaning marble and other stones; for cleaning pieces to be galvanized, it is of great service, as it does away with the possibility of the acid eating into the metal and impairing its strength.

In a short discussion which followed, replying to the question, "Where is the best place to take the supply of air from the tank?" Mr. Warren said in most cases he had taken the air from the top of the tank. While he thought there was some chance of getting moisture he ran the air into the top of the tank but in the inlet flange had a double pipe thread and ran a pipe inside the air receiver so that the moisture was driven to the bottom. There would probably be a little water there but it would stay in and not come out. He had seen other schemes where the pipe had been put in on a tangent, and the water would strike the tank by centrifugal force and run down the side of the tank. The member asking the question said he represented the Geo. V. Cresson Co. and had been told by a man claiming to be posted on such matters that it was best to tap at the bottom, but on trying this plan it was found to be entirely wrong. There were three sand blast outfits in the Cresson establishment and he could endorse everything Mr. Warren had said in regard to the effectiveness of the system.

Asked whether the plan of using a sand blast in connection with a tumbling barrel was successful, Mr. Warren said there was one in the Cramp shops working all right, and the Ingersoll-Sergeant Drill Co. had one also which gave satisfaction. The latter concern used theirs for cleaning air cylinders, and the castings were cleaned better in this way than in any other, and more economically. The barrels were made in different sizes. A barrel 40x48 inches was perhaps as large as it was advisable to use. They were filled about half and operated from 20 to 30 minutes at a charge.

J. S. Hibbs said a sand blast plant had been recently installed at the works of the National Brass & Iron Co., Reading, Pa., where it was used for cleaning picture frames, lamp bases and other castings of an ornamental character. For years previously such work had been cleaned by the pickling process for plating, requiring four carloads of acid per year for the work. During the six weeks the sand blast had been in use it had been demonstrated that the saving in acid for one year would pay for the whole outfit, and the castings were cleaned better and were better for electroplating. In their business what is called "matt work" was quite fashionable in ornamental metal work, and the sand blast was utilized to give castings this appearance.

A motion was then made and passed providing for the regular summer vacation, and adjournment was made until the first Wednesday in September. The usual lunch was served after the meeting.

Trade Publications.

The Osborn Mfg. Co., of Cleveland, in a 100-page catalog just from the printer, and identified as Catalog No. 102, brings down to date the illustrations and descriptions of its line of foundry supplies, brushes and brooms. The company, with its recent enlargement of plant and the introduction of new machinery, has equipped itself in a special way for the manufacture of brushes and brooms adapted to the needs of foundries, stove and furnace manufacturers, builders of machinery, locomotives, cars, etc.

A booklet published by Arthur Koppel, 66-68 Broad St., New York, calls attention in a unique way to the Koppel forged steel shoes and dies, extensively used in mining operations in the United States, Canada, Mexico, South Africa, India and Australia. The cover bears a suggestive picture—a procession of gnomes carrying shoes and dies to an old shoe of mammoth proportions. The discussion in the pages following bears on the important part played in stamp mills by shoes and dies and emphasizes the value of those that wear evenly and slowly without splintering. The cost per ton of the ore crushed is referred to as the real test of their value. There is also represented in the booklet the varied line of industrial railroad equipment manufactured by Arthur Koppel, including light steel rails, portable track, turntables and mine, dump and ore cars. The double side-dump car and the car equipped with grpi attachment for coupling but without dumping are shown.

In a catalog 9⅜ inches wide by 6¾ inches, and containing 181 pages, the Allis-Chalmers Co. gives illustrations and elaborate data concerning the Reynolds Corliss engines built at the Edward P. Allis works at Milwaukee, Wis. Beginning with views of the various shops at Milwaukee the volume presents in turn views of the company's standard engines, air compressors, rolling mill and blast furnace engines, hoisting engines, and the extensive power plants for lighting and street railroad service with which the Allis name is familiarly identified.

The Rock River Machine Co., of Janesville, Wis., has put up a temporary building since the loss of its plant by fire early in the year, and is very busy with accumulated orders.

The Armstrong Bros. Tool Co., of Chicago, has completed the re-equipment of its plant and has entirely recovered from the confusion and delay resulting from its recent fire. The company has largely added to its facilities and is now better able than ever to take care of an increasing business. Floor space amounting of 30,000 square feet and an ample equipment of modern machinery are now employed in the manufacture of Armstrong tool holders.

The Western Tool Co., of Lansing, Mich., is conducting the selling business formerly carried on by A. T. Van Dervoort, and in addition controls several special tools that will be manufactured at Lansing. The officers of the company are: President, H. H. Larned; vice president, J. P. Edmonds; secretary and treasurer, A. T. Van Dervoort.

REPAIRING A BROKEN CYLINDER.*

BY H. M. LANE, SCRANTON, PA.

When visiting the plant of the Lackawanna Iron & Steel Co., recently, the writer came across a very interesting repair job, and as the methods used in it are applicable to many similar cases, it was thought that a short description of it would be of interest to the members. The history of the case is as follows:

The engine was a horizontal blowing engine having cylinders 60x100 inches. In 1896 the engineer started his engine rather carelessly, and water in the cylinder knocked out the head, tearing away a portion of the flange on the end of the cylinder and breaking away a little of the casting near one of the ports. In order to repair this the broken portion of the flange was removed and a new casting made for it. A pattern maker was employed to make a pattern for this, and also a pattern for a brass patch, which was to go over the back of the cylinder covering the broken parts and holding them in place. This patch was about the size of the one shown in Fig. 1. It took the pattern maker about a week to glue up the stock and work out this pattern. When the pattern was complete a brass casting was made to fit over the broken parts and the new casting when was to replace part of the flange, and holes drilled through the brass into the cylinder. These holes were fitted with reamed bolts, and when the patch was secured in place the edges of the brass were calked down to the cylinder so as

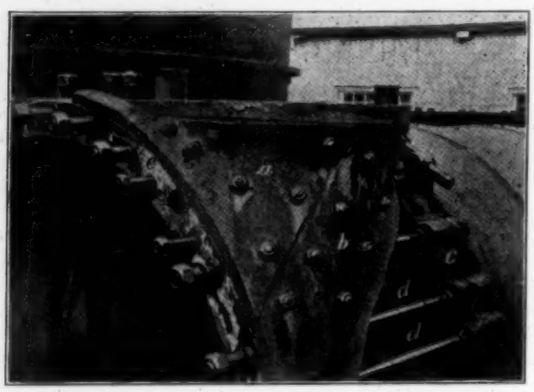


FIG. 1.—REPAIRING A BROKEN CYLINDER.

to make a steam-tight joint. It would not have been safe to attempt to carry the cylinder head upon this patched flange, and, as a consequence, a strip was secured to the cylinder back of the ports and long studs carried through to this strip, thus taking all strain off the flange. This patching job was very successful, and is still in place. Two years later, in 1898, a similar accident occurred to the crosshead end of the cylinder, only the break was of a much more serious nature. The entire uppor portion of the front end of the cylinder adjoining both ports was broken into more than a dozen pieces. The company wished to get the engine started as quickly as possible. They went to the makers and asked under what terms they could make a new cylinder. The makers asked $1,000, and could not furnish it short of two or three months. As a consequence, the repair gang was set at work to see if they could not fix the cylinder.

A. H. Lee, who is in charge of the blast furnace plant of the company, planned out a method of repair which proved very efficient. His experience of two years previous with a wooden pattern had shown him that this method was slow and costly. As a consequence, he simply placed the broken pieces together, blocking them in position as well as possible. He then had one of the bricklayers of the repair gang arrange a clay patch over the broken parts. It was desired to make this clay patch just one inch thick at all points, and to accomplish this one-inch brads were forced in until their points came in contact with the iron, and the clay was cut down flush with their heads. After the patch was in place, a rough wooden box was arranged about the end of the cylinder and a plaster cast taken of the same. As soon as it as hard this plaster cast was removed, the clay cleaned off, the inside of the plaster cast and the cylinder treated with a coat of oil, the plaster cast returned to the cylinder and plaster of Paris poured in between the outer cast and the cylinder, thus forming a plaster of Paris pattern of the desired form. The port, shown in Fig. 1, was of such a form that a single pattern could be made which would draw from the sand freely. In the case of the port shown in Fig. 2, the break was of such a character that it would be impossible to make a single pattern which could be drawn from the sand, and hence a piece of tin was inserted while pouring the patterns, and two patterns, a and b, made. After the plaster had hardened the outer cast was removed and the plaster patterns removed from the cylinder.

It was foreseen that shrinkage along the line between the castings a and b would result in opening this space, and, as a consequence, wooden strips were attached to these edges of the pattern. While it took the pattern maker a week to make the patterns for the head end of the cylinder, all of the patterns for the crosshead end of the cylinder were made in less than a day. These plaster patterns were then taken to the foundry and brass castings made from them. It was found that these castings fitted the cylinder very closely, and a small amount of filing and scraping brought them to a remarkably good bearing. After this, two or three holes were drilled through each casting and the cylinder and rough bolts put in. Other holes

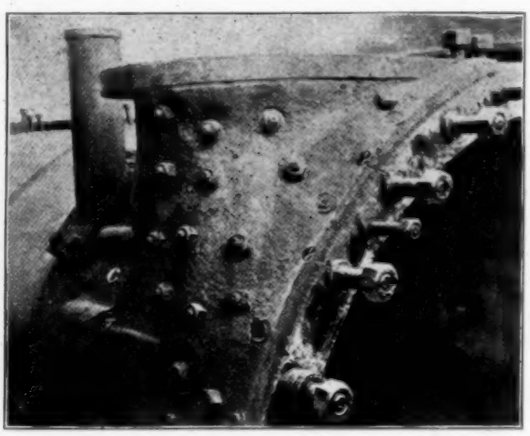


FIG. 2.—REPAIRING A BROKEN CYLINDER.

were then drilled and reamed and fitted bolts placed in them, and finally the holes containing the rough bolts were reamed and fitted bolts placed in them. The boilermaker was then called upon to calk the joint between the castings a and b, Fig. 2, and the edges along which the castings came in contact with the cylinders.

In order to relieve the flange from strain as far as possible, the strips, c, Figs. 1 and 2, were secured to the cylinder back of the ports and long studs, d, carried from these strips through the ports and cylinder flanges to the cylinder head. These studs were turned with collars, as shown at e, which would serve to hold the flange in place. As a further precaution, the new cylinder head was made thicker than the old. The cylinder in its patched condition did not leak at all when steam was turned on, and has been in use for three years. It has now been removed from its old setting, and will be used with its engine in a new location. When the brass patches were placed upon the cylinder the space beneath them was filled with Japan filling, so as to aid in making them steam tight and in giving them a good bearing. All of the breaks at both ends of the cylinder occured in the counterbore and ports, none of them extending into the portion of the cylinder over which the piston traveled. The engine was actually shut down three weeks during the second repair job. This was a considerably longer time than was necessary; but after the repair gang had made sure that they could mend it on short notice, work was not pushed so rapidly as to interfere with their other duties.

* Read at the Boston meeting (May, 1902) of the American Society of Mechanical Engineers.

The Supreme Court of the State of New York last week issued an order dissolving the Buffalo Charcoal Co., of Buffalo, N. Y. About a year ago the company's interests were sold to the Buffalo Union Furnace Co.

The Combined Blast Furnace and Open-Hearth Furnace.*

BY P. EVERMANN, OF BENRATH, NEAR DUSSELDORF.

For many years past the efforts of steelworks engineers have been unremittingly directed to the improvement of the original open-hearth furnace, and as the demand for open-hearth steel has latterly risen beyond all previous anticipations, the larger steelworks have been compelled gradually to extend their plant by the construction of whole series of open-hearth furnaces of widely varying capacities. In his native country, Styria, the author had opportunity some years ago of becoming acquainted with the great steelworks of the Austrian Alpinen-Montan Gessellschaft at Neuberg and Donawitz. Even then the consumption of coal used in the melting process had been reduced to a comparatively low percentage. In the course of time he was also able to witness the combined process as practiced at Teplitz, in Northern Bohemia, where it was customary to melt the raw material in the open-hearth and finish in the basic Bessemer converter. The excellent quality of the plates produced from this steel has never been called in question. Many years ago, too, the reverse method was adopted at Witkowitz, and the process as carried out there of previously fining the liquid pig iron in the Bessemer converter, and of finishing it subsequently in the open-hearth, has been fully described in a paper read before the Iron and Steel Institute by Mr. Kupelwiesser in 1893, and also in *Stahl und Eisen* (1902, No. 1). It has been the constant endeavor of all steelworks managers to improve the open-hearth process as such by every possible means, the ultimate aim being to enable it to compete successfully with the Bessemer process, which in many countries is still pre-eminent as regards the low cost of production. The steel-making process which Martin first successfully carried out in France in conjunction with Siemens soon found further development in Great Britain, and some excellent types of furnaces were designed by Batho, Dick, and Riley. After this new process had assumed a practical form, Friedrich Krupp of Essen turned his attention to it, with the object of ascertaining whether it might not advantageously be combined with the now famous Bessemer process. No improvement of a lasting nature was, however, effected.

Blast Furnace Improvement.

Simultaneously with the development of the various processes for the production of steel (among which the author specially emphasizes the basic Bessemer process in Germany) the development of the blast furnace practice was also proceeding with rapid strides. F. W. Lürmann, of Osnabrück, who has planned and carried out a greater number of blast furnace installations than any other engineer, may be regarded as the standard authority on European blast furnace practice. As regards England and America, blast furnace construction in those countries may be said to have been developed independently, since most of the works built their furnaces in the manner dictated by their own experience. It was reserved for Belgium to take the lead in developing the most recent important innovation in blast furnace practice, one which is now coming rapidly into extended use. The Cockerill Company of Seraing, near Liége, was the first to carry out experiments on a large scale for the utilization of blast furnace gas for the direct driving of internal combustion engines. The details of these trials are already so well known to the members of this Institute that to enlarge upon them here is unnecessary. Not only in this country, but more especially in Germany, has the adoption of gas-driven engines found favor, and whereas it was the common practice in former times to build blast furnaces with open throats, now every possible precaution began to be taken for the prevention of waste of the gas, and at the same time the appliances for closing the furnace tops became more and more complicated as the gases continued to be increasingly utilized for different purposes. Thus in recent years they have been turned to account not only for roasting the ores and the heating of the hot-blast stoves, but also for generating steam in the boilers for driving the blowing-engines. Thence it was but a step further to employ the gases in driving the blowing-engines direct.

*Read at the meeting of the Iron and Steel Institute at London, May, 1902.

This idea, or at all events its practical application, first originated in this country, where so many others of a like nature in other technical branches have had their inception, and an engine driven by blast-furnace gas was put down by the Glasgow Iron & Steel Co. in 1894. It should, however, not be forgotten that to Lürmann the credit is due of having first drawn attention to the practicability of the idea in 1886. Nevertheless, the real practical importance of this new departure was not fully recognized until the Hörde Works and the Differdingen Company followed the example of Cockerill, and decided with true enterprise to drive their entire plant with the new type of gas engines. The difficulties anticpated in the purification of the gases as they came dust laden from the blast furnace caused great misgivings to all blast furnace engineers at the outset, but they were for the first time successfully overcome at these places. At the present time the whole gas-washing apparatus consists of a most simple mechanical arrangement comprising two fans which are capable of dealing continuously with the total effluent gas of three or four furnaces. This all important question may thus be regarded as having found an entirely satisfactory solution.

New Type of Open-Hearth Furnace.

The object of the above brief review is merely to define the standpoint from which the further development of the new combined blast furnace and open hearth process takes its rise. in July, 1898, the author patented a design for a new type of open-hearth furnace in which the fining process could be simultaneously carried on, and the wording of the patent specification especially carried on, and the wording of the patent specification, especially in the case of the Austrian one, leaves no room for doubt that he intended to avail himself of the tilting open-hearth furnace. Owing to the fact that the Daelen-Pscolka process, which had seemed to promise great results, had not up to the present realized the expectations of its inventors, the author was encouraged to proceed further with the perfecting of his furnace, but it was only after the German Patent Office had repeatedly raised objections to his claim that he began to study more closely the various processes which involved simultaneous fining. But, in spite of all, he maintained his first resolve to carry out the fining process in the open hearth itself. In June, 1899, the first designs of such a furnace were submitted to several firms for their consideration, but, as the author is now bound to admit, they did not meet with any measure of approval owing to certain important technical objections. This was due, in the first place, to the fact that the works were already sufficiently well equipped for the production of steel on a large scale, and, secondly, to the fact that the system put forward was still imperfect. So far from being discouraged, however, he entered into relations with some of the great American works, and in the summer of 1899 went to Pittsburg, in the hope that there his ideas might meet with a more ready appreciation. The system he then proposed was based on the following line of reasoning. In the modern basic Bessemer process liquid pig iron is converted into steel of any desired quality by the simple means of blowing air through the bath of molten metal. The complaint has nevertheless frequently been heard that there are many purposes to the application of which this material is less suited than that produced in the open-hearth furnace, the product being. in fact, inferior to the latter, and there is no doubt that the true explanation of this inequality is that the blowing operation is too rapid to permit of keeping pace with the reactions within the converter by means of exact chemical analyses. One could therefore, so to speak, only depend on the physical senses of the assayer. But after the mixer was introduced, the blowing process, both acid and basic, was so far simplified that any question of a difference between the quality of Bessemer and open-hearth steel can now be entirely disregarded because the composition of the liquid pig iron which is drawn off from the mixer is definitely determined beforehand.

The iron always contains an approximately even percentage of silicon, carbon, phosphorus, etc., and it is therefore much easier to produce the desired quality of steel. In the open-hearth process, on the other hand, the mixer never played an important part, because here there was always ample time to make the required analyses at any desired moment, and the quality of the steel was thus assured without resorting

to the use of a mixer. At the present day, therefore, in the various methods of production, the governing factor, has come to be not so much a question of quality as one of cost, and in many countries, as already mentioned, the Bessemer process, until a few years ago, stood unrivalled as regards cheapness of production compared with the open-hearth process. An open-hearth furnace produces on an average only 100 tons of steel per day irrespective of its capacity. Neither can it be said that the output has been much increased by the introduction either of the Talbot process in America, or of that of Bertrand-Thiel in Austria; but it was otherwise in Witkowitz, for here a very much higher output was obtained through combining the Bessemer process with that of the open hearth. Despite the increase, however, it will be readily understood that the cost of production was in no way reduced; indeed, if anything, it was found to exceed slightly that of the simple open-hearth process.

On the other hand, a single converter has been known to produce 1,000 tons daily, and even more, though this quantity, which is perhaps the highest on record, cannot be taken for the purpose of establishing a fair comparison. It may, however, safely be assumed that one converter is equivalent to seven open-hearth furnaces in point of production, which fact affords an excellent indication of the superior capacity of a Bessemer steelworks.

Nevertheless the question of comparative cost is largely affected by the price of scrap iron, for if the latter can be obtained at very low rates, the cost of production by the open-hearth process approximates to that by the Bessemer process, until it may even occur that the former falls below that of the latter.

In the case of those works where a large quantity of liquid pig iron is available, a considerable advantage might result from the introduction of a new method of preparing steel, which, however, must filfil the condition of cheapening the cost of production while increasing the output, a less costly plant being at the same time required. That is to say, that an increased quantity of steel must be produced in a shorter time than has hitherto been possible either by the use of a converter or of a series of 5 to 7 open-hearth furnaces, and if the new type of furnace was capable of producing steel of good quality without a mixer, this too could be dispensed with. The mixer is, in fact, only an unwieldy adjunct, the use of which was rendered compulsory solely on account of the inefficiency of old fashioned appliances, and it is obvious that to meet modern requirements improved methods are necessary. The working of the new furnace is effected without the aid of expensive blowing engines, such as are required for converters, and the expensive buildings necessary for the accommodation of a long row of open-hearth furnaces can likewise all be dispensed with, together with the entire gas producer plant, traveling cranes, etc. In 1900 the author was able for the first time to publish in the journal *Stahl und Eisen* a description of the furnace and the process.

The furnace, as originally designed in 1899, is constructed on the same principle as the ordinary American tilting open-hearth furnace, or as the mixer, and resembles these in so far that, by means of hydraulic cylinders or worm gearing, it can be turned or tipped on rollers, or segmental rockers which roll forward on a flat surface. In the writer's opinion, the ideal center of rotation is the point where the two vertical axes cut one another. The furnace itself is built inside a structure of girders and plates, which must be of very strong design in order to withstand the excessive strains due to the bath of metal and the heavy masonry. The interior is constructed in four segmental divisions formed of arched brickwork, two of which serve as hearths for the steel production. Of the latter, one is very narrow, and is provided with air nozzles similar to those of a Bessemer converter. This bottom may either be arranged in the same manner as an ordinary converter, so that the air holes are evenly distributed over the whole surface, or nozzles may be fitted separately into the hearth, so as to permit their ready renewal. Along the exterior wall of the furnace a wind box is built, into which air can be introduced by means of a flexible tube.

Manipulation of Liquid Metal.

In order to blow liquid pig iron preparatory for the open-hearth process, the furnace is turned round until the blowing hearth occupies the lowest position, and the iron is poured in through the pouring spout. If a blast pressure of two atmospheres were available, this could be at once utilized for blowing, either by shutting off the blast from the blast furnace, which in any case would be necessary during tapping, or the air could be diverted direct from the pressure main. When all is ready the liquid metal can be run off from the blast furnace direct into the compound furnace, or it can be transported in a hot metal ladle according to the local facilities. As soon as ever the metal begins to flow in, the blast should be turned on through the bath. If the pig iron is fairly rich in silicon and phosphorus, the combustion of these constituents alone will serve to heat the bath sufficiently without the aid of the gas and air. The arched wind box closes the furnace on the outside, and any particles of metal which collect in this during the time of blowing can be melted out during the subsequent stages of the process. The gases evolved during blowing pass off through the regenerative chambers to the chimney. On completion of the blow the furnace is turned down to the normal working position, and in so doing the bath of metal flows from the blowing to the melting hearth, and the blast is shut off to prevent cooling or burning of the metal. The open-hearth process then begins in the customary manner. Additions of ore or scrap can be made through side doors or openings provided for the purpose in the outer arch, or through inclined shoots, or otherwise, as the case may be. Instead of the double furnace crown, a single one will suffice as in any ordinary furnace, but by constructing it with the double crown with openings, hot or cold air can also be blown in from the top, by which means not only is the heat of the flames directed downwards towards the bath, but the entering air serves the purpose of a third supply, when such is required to promote the combustion of the gaseous fuel. This has been termed "third supply," because the first is admitted through the gas producer, while the second is introduced through the air port, which is arranged in annular form round the gas port, though not concentric with the latter. If the furnace is situated in the neighborhood of the hot-blast stoves, the hot air from these may be used for this purpose. The arrangement of the two hearths has the further advantage that one can be worked as an acid, the other as a basic hearth. The air port through which the heated air from the regenerators is conducted entirely surrounds the gas port, but is placed out of center with the latter, because by this means the thorough mixing of the gas and air is promoted. It will depend upon the construction of the furnace by how much the distance can be reduced between the furnace crown and the surface of the bath of steel.

The gas is also led from the regenerators through a port that is circular in cross section, and according to the quality of the gas it will depend whether the flue of refractory material should project into the furnace and terminate as near as possible to the bath, or whether it should stop short within the air port. In order to prevent as far as possible the leakage of air inwards at the furnace ends, a water-cooled ring is fitted over the clearance space in two halves, which can be eased back by a simple mechanism, when it is desired to tilt the furnace.

The slag which collects on the surface of the bath may be poured off through the spout during the process, and the product when finished is also poured off through the same opening.

Blast Furnace Gas in the Open-Hearth Furnace.

The process was in the stage as above described when it occurred to the author that the blast furnace gas itself might be employed for the heating of the open-hearth furnace. The idea was a striking one, inasmuch as it at once opened up the possibility of dispensing with the whole of the accessory plant necessary for the production of steel. In this matter he was able to avail himself of an invention brought out as long ago as 1883 by von Ehrenwerth, which relates to the regeneration of blast furnace gas. It is true the appliances suggested by him were never put to a test, but this was probably due to the fact that at that time the problem of the manufacture of water gas was absorbing general attention. Von Ehrenwerth has calculated at 704.26 calories the absolute calorific value of blast furnace gas of the following composition:

	Percent.
Carbonic oxide	24.23
Carbonic anhydride	20.60
Hydrocarbons	0.38
Hydrogen	0.21
Nitrogen	54.58
	100.00

If this gas were perfectly regenerated it would contain:

	Percent.
Carbonic oxide	42.42
Carbonic anhydride	0.00
Hydrocarbons	0.21
Hydrogen	0.15
Nitrogen	57.22
	100.00

and its absolute calorific value would be increased to 1098.47 calories.

In practice the same gas if regenerated would be constituted as follows:

	Percent.
Carbonic oxide	34.87
Carbonic anhydride	8.37
Hydrocarbons	0.28
Hydrogen	0.18
Nitrogen	56.30
	100.00

and the calorific value would be 936.54 calories.

According to Hiertz the composition of blast furnace gas is:

	Percent.	Percent.
Carbonic oxide	27.90	23.98
Carbonic anhydride	13.90	16.78
Hydrogen and Hydrocarbons	1.02	1.07
Nitrogen	50.12	51.51
Water	7.01	6.66
	100.00	100.00

At 0 degrees C. and 30 inches barometric pressure the absolute heat effect is 1166 and 1046 calories respectively, and at 15 degrees C. with 1 percent of moisture in the atmosphere the absolute heat effect is 1094 and 982 calories respectively.

If it were required to regenerate these two samples of gas, the following would be the composition of the mixtures of gas with perfect regeneration:

	Percent.	Percent.
Carbonic oxide	52.20	51.00
Hydrogen and Hydrocarbons	1.67	1.65
Nitrogen	46.13	47.35
	100.00	100.00

and the absolute heat effect would be 1500 and 1472 calories respectively.

The author then made a few simple modifications in the ordinary water gas producers, in order to obtain as a substitute a fuel which could satisfactorily fulfil all the thermal conditions of open-hearth working, the rough and severe nature of which is scarcely compatible with the somewhat refined process of water gas production. Thus the evolution was complete of the new open-hearth furnace as illustrated in the annexed drawings. The author's invention relates both to a new process and the necessary apparatus for enabling the production of steel to be carried on much more rapidly and cheaply than is possible with the appliances of the present day. The means adopted for the attainment of this object are the employment of the blast furnace gases for heating the open-hearth furnace either in a direct way or after their passage through a coke tower of special form, whereby their quality is essentially improved. For this latter valuable suggestion the author acknowledges his indebtedness to Mr. F. Toldt, who recommended the use of two or three of these towers on each side of the furnace instead of on one side only.

After cleaning the gases by any one of the known methods, an operation which is not imperative under all circumstances, they are raised to a certain pressure by means of a fan specially provided for the purpose and are forced along a main to a regulating valve. The quantity necessary for combustion flows through an ordinary reversing valve into the flue leading to the regenerative chamber. The air for combustion is introduced in the customary manner, and should the working of the furnace require it, this too can be introduced under pressure, in which case a second valve must be provided for its control. The air also passes through a reversing valve into the flue which conducts it to the air regenerator. The manipulation of the reversing valves can be effected in any convenient manner by levers placed on the charging platform. The gas for combustion first passes into the regenerative chambers, which are filled out in the usual way with chequer-work. The gas enters at the bottom, is heated by contact with the bricks, and rising to the top of the chamber, passes out through a flue which leads downwards to the bottom of the coke tower. This apparatus resembles in its construction an ordinary gas producer and the gas flowing through it reaches the uptake, which finally conducts it to the melting hearth of the furnace. The tower consists of three main divisions or compartments. The upper one, as previously mentioned, is constructed in the form of an ordinary gas producer. On the dome-shaped top is fixed a charging hopper, through which coke, wood charcoal, or other carbonaceous material can be charged, precautions being taken to prevent the escape of gas while charging is proceeding. The disc valve which closes the opening is made of refractory material, and the central division of the coke tower is provided with small doors, through which the removal of the ashes, which collect here, can be easily effected. The third and lowest compartment of the coke tower has the form of a gas holder, the top being formed by a cover perforated in several places by small openings. When the gas which collects in this chamber attains the necessary degree of pressure, it passes up through the openings first into the ash chamber and from this through the bed of the incandescent coke into the upper compartment. On first starting the apparatus, air must be admitted from underneath, but it is shut off again as soon as the lower layer of fuel is fairly ignited. In order to maintain a constant rate of combustion within the apparatus in case of having to work only with producer-gas, air inlets are provided at the side, which are in connection with a wind box. In addition to this arrangement another flue, which serves as a by-pass, leads from the gas generator, and, passing round about the coke tower, emerges direct in the main uptake to the furnace. The air requisite for combustion, after passing through the reversing valve and the flue leading therefrom, enters the air regenerative chamber at the bottom. This also is provided with chequer-work in the ordinary way, and the air, in flowing through, becomes heated and then enters the circular uptake which terminates within the furnace. The heated gases then burn with intense heat, and the products of combustion pass off in the usual manner through the regenerative chambers to the reversing valves, and thence to the main flue into the chimney, the draught of which is regulated by means of a damper.

Construction of the Furnace.

With regard to the furnace itself, this can be either of the stationary type, or a tilting furnace can be employed on the American plan. The author recommends the form of construction where two separate hearths are arranged, one of which is in all respects similar to that of any other open-hearth furnace, while the other is provided with air nozzles like an ordinary Bessemer converter, which is directed downwards on to the bath of metal. Their outer ends are in connection with air chambers which communicate with each other by means of tubes. Between the air chambers doors can be arranged which permit inspection during the working process, and also serve the purpose of charging doors if necessary. The air for blowing is conducted through flexible tubes and can be controlled by a valve placed in the main. The flow of the gases through the uptakes is also controlled as desired by dampers which are inserted in each gas and air passage. The air, whether for fining or for the working of the coke tower, can be drawn either direct from the cold blast main of the blast furnace plant or from the Cowper stoves. It is obvious that by means of this combination the furnace can be worked with four kinds of gas—that is, either with clean blast furnace gas; with blast furnace gas enriched by passing through the coke tower; with gas generated by blowing air through the coke tower, or, finally, with a portion of the regenerated gas for combustion.

Since the arrangement of the furnace permits liquid iron to be tapped direct from the blast furnace into the open hearth, the position assigned to the air chambers is undoubtedly the most convenient one. In continuous working it might even

be found that the gas regenerative chambers could be dispensed with, an advantage tending much to simplify the working of the furnace. In this case the plan of having two chambers on either side would be modified to the extent that the gas-heaters would serve the purpose of heating the gases; one being employed in enriching the gas, while the other was being heated up. The furnace itself rests on two semicircular rings of rollers, and a curved toothed rack, corresponding to the radius of the roller bed, is fixed to the body of the furnace. A pinion gears in this rack, which is driven by an electric motor. The iron from the blast furnace flows in on that side on which the valves are placed, and the finished steel is poured off on the opposite side.

The novel features of the furnace and of the process may be shortly summarized as follows:

1. The employment of blast furnace gas in the open-hearth furnace.

2. The insertion in the gas uptake of a specially constructed chamber containing carbon for the purpose of improving the quality of the blast furnace gas. The latter generally contains a large proportion of carbonic anhydride, which is thus converted into a double quantity of carbonic oxide. The moisture also, which otherwise exercises a deleterious influence, undergoes the following reaction, $H_2O+C=2H+CO$, and is thus converted into the valuable product commonly known as water gas.

3. The application of air nozzles to one of the hearths. By imparting a slight rocking movement to the furnace with the electric motor, these can be brought nearer or farther from the metal bath. Fresh particles of iron are thus constantly brought into contact with the blast, and the process of fining is greatly accelerated.

4. The carrying out of every known furnace process, including the Talbot continuous process, in a vessel heated by blast furnace gas.

5. The combination of the fining process with the usual finishing processes in one and the same vessel.

The Blast Furnace as a Producer of Gas.

It were desirable, both as regards this new process of steel production and the working of the blast furnace, and all apparatus in connection therewith, to consider the blast furnace from a new point of view. Up to the present it has been the usual practice to build blast furnaces at such places where the production of pig iron was most conveniently carried on. Thus they were erected either in the neighborhood of collieries and coke-oven plants, or in close proximity to the iron ore deposits. Now, on the other hand, when not only pig iron but also power gas for engines is produced, another consideration arises, namely, how the gas from the blast furnaces may be most remuneratively applied. The time is likely to come when such blast works will be established in the neighborhood of great towns and thus provide a source of power for driving the great municipal central lighting stations. Influenced by these considerations, the author has devoted much attention to the study of modern blast furnace construction, and since in his opinion the blast furnace of the future may be regarder rather in the light of a gas producer than that of a pig iron producer, certain modifications have been introduced in order the better to fulfil the new requirements.

Without entering too closely into details, it may be of interest to refer here to a new form of charging appliance, consisting of a continuously working bucket elevator, which conveys the mixed charge and coke in smaller quantities than is usually the case, and tips it on to the bell. In this manner the distribution of the material in the furnace is the most uniform possible, and consequently a greater regularity in the evolution of the gases is assured. As a precaution against the unnecessary waste of gas, the throat of the furnace is provided with a bell of the ordinary form, below which is suspended a vertical revolving tube. Within the latter is a screw which is also capable of independent rotation, down which the charge gradually slides into the furnace, and is thus distributed with perfect evenness round about. The surface of the screw might be made adjustable in an axial direction, and the revolving motion so arranged as partially to compress the charge, thus forming a further preventive means against the escape of gas. Outside on the top are fixed two cylinders in tandem fashion, filled with oil and fitted with plungers, which are suitably connected by means of levers to the bell. By this means the lowering and raising of the bell is effected automatically at certain intervals, the operation being aided by the weight of the charge accumulated on the bell. This arrangement is an absolutely sure preventative of the escape of gas through the hopper. The drawing off of the gases takes place chiefly at the center of the furnace through a ring-shaped pipe which entirely encircles the vertical charging tube, and as a precautionary measure against explosions safety valves opening outwards are fitted on the sloping surface of the conical shell forming the cover. Further, it will be seen from the drawing of this "pig iron gas producer," that the main supporting frame of the furnace combines certain features of both German and American practice. In the author's opinion the American plan of the loose shell is a very excellent one, also the system of water-cooling which extends right through the brickwork to the bosh walls. Moreover, Lürmann's arrangement for running off the slag, and his method of jointing the masonry between the upper and lower parts of the furnace, are much to be recommended. As regards the tuyeres, the elliptical form of opening for the nozzle is perhaps the most suitable, since these have proved so efficient in the case of large cupolas. It has often come under the author's notice that the rings encircling the furnace bosh, a special feature of American construction, are liable to burst from the strain caused by excessive heating, and it might therefore be an improvement to shape them so as to form reservoirs for cooling water. The whole of the lower framework stands free, and is not walled in by masonry, a plan which is greatly to be preferred, since the chilling of the furnace hearth by the formation of "bears" cannot occur. The great waste of water in cooling the lower portions of the brickwork, which so frequently occurs in America and cannot be controlled, is at any rate avoided by this means.

It remains still to be mentioned that cast iron water-cooled rings might be most advantageously used to form the base of the brickwork of the furnace body. The blast furnace requires no casting bed, since the open-hearth plant serves instead of one. A much less space than formerly is therefore required for a steelworks arranged on this new plan. The space taken up by the boilers for driving the blowing engines is also entirely saved, and in laying out a blast furnace installation on the basis of a daily production of 500 pounds, two new open-hearth furnaces would amply fulfil all requirements to convert this product at once into steel. According to the quality of the pig iron and scrap iron available, and also that of the steel to be produced, it may even be possible to convert the whole quantity in one furnace.

Charlotte Furnace to Be Started.

Corrigan, McKinney & Co., of Cleveland, have taken a lease of Charlotte Furnace, at Charlotte, Monroe Co., N. Y., and will operate it on foundry iron. The stack, which is 65x15 feet, was rebuilt in 1884, but has been operated comparatively little since that year and its machinery is generally in good condition. An ore trestle will be built and the furnace relined and the number of tuyeres increased to 12. This work, which will require about ten weeks, will increase the capacity of the furnace to about 200 tons a day. Lake Superior ores will be used and the fuel will be coke, instead of mixed anthracite and coke as heretofore. It is expected to put the relined stack in blast about Sept. 1.

A joint meeting of the stockholders of the Railway Steel Spring Co. and the Steel Car Wheel Co. was held June 3 in Jersey City. It was decided to ratify the merger of the two companies as proposed by the directors in the circular issued May 9. It was decided to increase the board of directors from 11 to 15 and the board now includes the following: Samuel R. Callaway, Julius E. French, Truman H. Newberry, Charles Scott, Charles Scott, Jr., Frank S. Layng, George B. Sloan, Jr., Frank B. Smith, S. L. Schoonmaker, Philo N. French, William H. Silberthorn, James C. Beach, J. W. Fuller, C. W. Barnum and Gen. Charles Miller. Charles H. Halcomb, who was a director in the old board, resigned.

COLD WORKING SHEET METALS IN DIES.*

BY J. D. RIGGS, PITTSBURG.

During the last half century a marked progress has been made in the art of working sheet metal. The introduction of more elaborate machinery and tools, and the change from hand-work to die-work, has brought about some very radical changes, both in the design of articles made of sheet metal and in the cost of producing them. The development of this art has led to the use of sheet metal in the construction of a great many articles formerly made of wood or cast-metal. As an example of what we often meet with I may mention that while visiting Cincinnati two years ago, I was shown parts for the body of a violin which had been stamped in dies from an aluminum bronze. These violins were said to be excellent instruments.

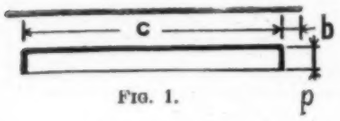


FIG. 1.

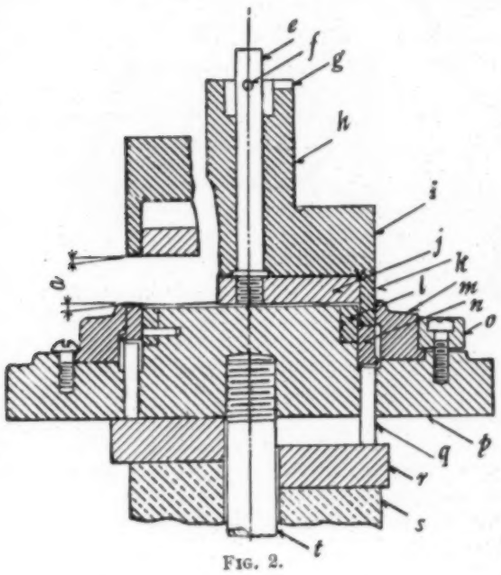


FIG. 2.

Dies operated by presses do a large share of the work of manufacturing sheet metal goods, and are useful in cutting out irregular forms cheaply and accurately, but their usefulness does not end here, for an endless variety of bending, drawing, and forging operations may be done by them, some bending or drawing operation often being combined with the cutting out and performed together with it. One of the most common pieces produced in dies is the end of an ordinary tin can. Referring to Fig. 1, this piece is cut into a round disc and then the annular portion b is drawn to the cylindrical form, p.

The problem of finding the depth of cup which a disc or "blank" will make may be solved by equaling areas of cylindrical ring, p, and annular ring, b.

$$\pi Cd = \pi (C + b)\, b = \pi Cb + \pi b^2$$

Reducing and allowing for stretch

$$p = b + \frac{b^2}{C} + s$$

And as the corner is always more or less rounded, we may say

$$p = b + \frac{b^2}{C} + s + \frac{r}{2}$$

where s represents the stretch or elongation of the metal in the edge, p, and varies from 0 to 5 percent of p, in tin plate or steel; r represents the radius of the rounded corner. The diameter of the blank is represented by

$$C + 2b$$

Fig. 2 shows a typical die as used in single acting presses for forming can ends and similar articles. The right side shows the die closed while the left side shows the relation of parts when open. The hardened steel ring, m, and the steel edge, k, of the punch, i, cut out the disc or blank. As the press continues to descend, the ring, n, clamps the annular part against the face of the punch, k, and produces a considerable tension in the metal as it is drawn over the central portion, l. As the die opens the ring, n, "strips" the finished piece up from l. Ring, n, is actuated by a spring through pins, g, and has adjustment by means of a nut on the lower end of the stud bolt, t. Both rubber and steel springs are in use, but either should be amply long. The die (collectively) consists of the die and the punch. When dies are required for cutting only, the die may be made as shown in Fig. 3.

A concern extensively engaged in the manufacture of tin cans has been using for some time dies similar to that shown in Fig. 2, in "gangs." They leave off the stem, h, from the punch and recess the body, i, of several into a large plate, and instead of the small plate, p, a large one is used with many dies set into it. In this manner gang dies are made to cut the alternate large discs shown in Fig. 4, and the sheet is then turned over from right to left, and the remaining large discs cut and formed into can ends. The die rings, m, Fig. 2, interfered with cutting all the large discs at one stroke. The remaining sheet is then laid aside, to be afterward put into another gang die, which cuts and forms the remaining discs into can caps, shown in Fig. 5, and button blanks, shown in Fik. 6. The die for each group of three small discs, and corresponding to m, Fig. 3, is made in one piece, which allows of cutting and forming the fifty-two pieces at one stroke of the press. Although this gang die formed two distinct articles, it did not mix them together, as the can caps came out on top of the die and slid back in the inclined press, while the button blanks formed on the peculiar punch shown in Fig. 6, and went through the die. It will be observed that this sheet of tin is not standard size, but is eleven by twenty-two inches, which was a very difficult size to get fifteen years ago. Gauges, G, Fig. 4, and notching die, H, were so arranged that the irregularity of the sheets would not be reproduced and interefere with using the second set of dies.

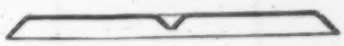


FIG. 5.

FIG. 6.

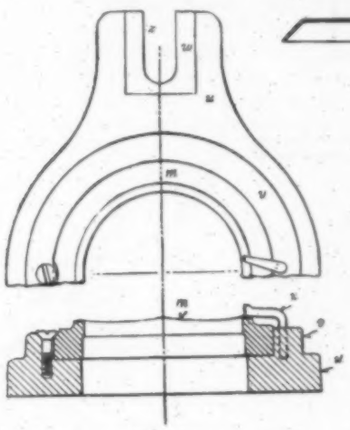


FIG. 3.

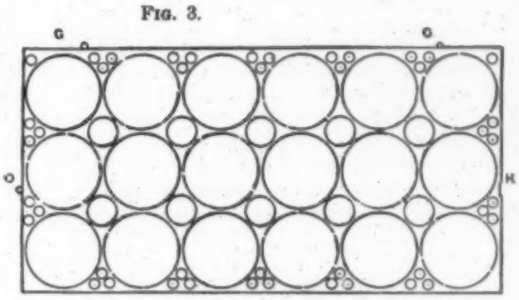


FIG. 4.

The depth which may be drawn at one operation is commonly expressed as equal to half the diameter for small cups and one-third or one-fourth for larger vessels. Fig. 7 shows a tin cup formed at once in a die represented by Fig. 2, with the exception shown in Fig. 8. The radial edge of the cup was required, and less than a square corner for the cutting

* Read at the Boston meeting (May, 1902) of the American Society of Mechanical Engineers.

edge of the punch was desirable. This concave face of the punch, k, together with a hardened and nicely polished ring, n, gave excellent results.

Where a depth greater than can be drawn in one operation is required, or a small boss is wanted near the center of a sheet, it becomes necessary to resort to two or more operations, forming a larger and shallower piece first, and then reducing this to the desired form.

An interesting example of this class of work was shown in operation at the Pan-American Exposition. The can-top shown in Fig. 11, ready for rolling a thread at t, was first cut and formed to the shape shown in Fig. 10, by a die of the type shown in Fig. 2. It then passes through some four other dies and through the forms indicated by dotted lines in Fig. 10, the last one of these dies cutting the hole in the top, trimming and turning the outer edge and shaping it up generally, but not materially reducing the diameter of the boss.

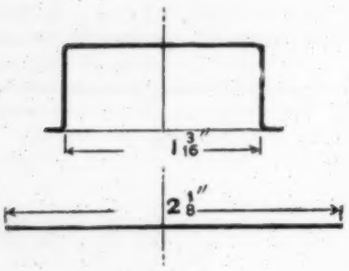


FIG. 7.

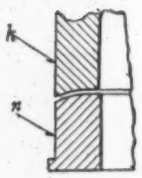


FIG. 8.

FIG. 9.

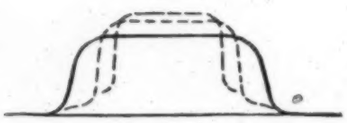


FIG. 10

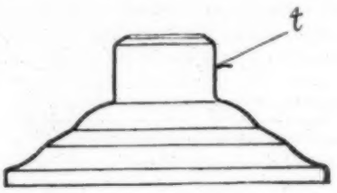


FIG. 11.

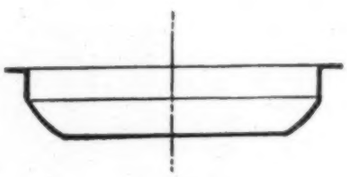


FIG 12

shows a piece formed of tin-plate in a die shown in Fig. 15, where the outer punch, b, descends, cuts out the blank, and, during its "dwell," clamps the disc against the ring, g, while the inner punch descends just far enough to give the required shape. This piece, Fig. 12, is then put into a die, Fig. 16, where the outer punch, i, clamps the tapering portion against the die, and the inner punch descends just far enough to produce the piece shown in Fig. 13. This piece is next put through a single acting die, which cuts the holes o and p, and rounds the base at q somewhat more. The piece is now put into a lathe, Fig. 14, which carries a pair of rotary cutters, r, on the back, and a curling roll, n, on the front end of the cross slide. After this lathe has trimmed and curled the edge the piece goes into a bath of hot palm oil to have its coat of tin re-shined, and is then ready to have other pieces attached and form the oil well of a tubular lantern.

The trimming cutters, r, and the curling roll, n, are used in

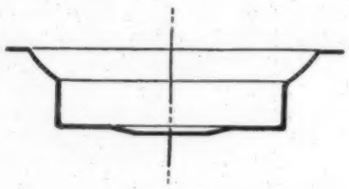


FIG. 13.

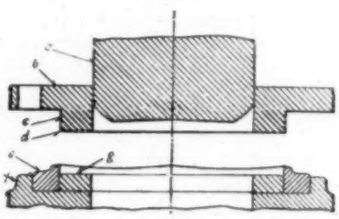


FIG. 15

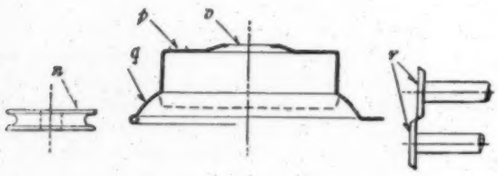


FIG. 14.

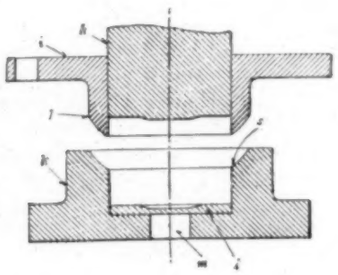


FIG. 16.

Another example of this reducing is found in one form of bicycle front fork crown, where a boss is formed to which to attach the fork stem.

In deep-drawn work the edge becomes irregular, and is often trimmed again before finishing the piece. In Fig. 9 the outer line is drawn directly from the piece shown in section in Fig. 10, while the inner line is a circle drawn to illustrate the peculiar irregularity of the edge, showing as is common four high points. I attribute these high and low points to the rolling mill which rolls the sheets.

Passing to work done in double-acting presses, Fig. 12, a variety of ways, either together or separately. Three of these rolls are often put into a body and form a chuck, to be used in a machine similar to a drill press, to curl the edge of pails and round vessels. If the dies shown in Figs. 15 and 16 had been made open bottom, and the inner punches had been adjusted lower, the piece produced would have been a cylindrical cup instead of as shown in Fig. 13. In drawing and reducing bright steel I have found it possible to draw to 9 inches diameter, anneal and reduce to 6 inches diameter at one operation; but this is rather too much, from 8 to 6 inches is much better. When the side of a cup is to be used as a

seamless band without flange, either inside or out, the tool shown in Fig. 17 will be of service in a lathe.

It is often necessary to turn a flange around a hole, but this is found a very different problem from turning an outer edge. In turning out a flange ¼-inch high around a 2-inch hole in IXX tin so many pieces were spoiled by cracking at the edge that we made new dies and drew the stock in, before cutting the hole. These holes were punched 1⅜-inch when turning them out to form a ¼-inch edge around a 2-inch hole. Another case of this kind was done by hand tools instead of in a press, and proved entirely successful. In Fig. 18, R represents a section of a steel bicycle wheel rim through the hole for the valve tube. The ⅜-inch valve tube required a $^{13}/_{32}$-inch finished hole. The rim was first drilled to one-third of the finished size. The hand punch, made to the finished size of the hole with the pilot, n, $^{1}/_{32}$-inch larger than the drilled size, was driven through with six or eight blows of a hand hammer, while the "hold on," q, weighing some three pounds, was held up with a light spring. Block, o, with

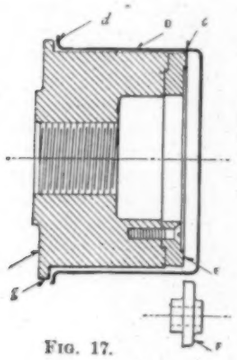


Fig. 17.

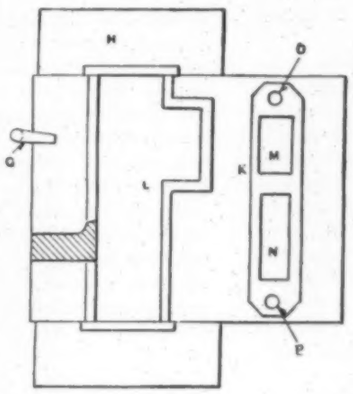


Fig. 19.

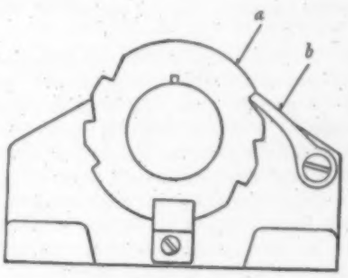


Fig. 21.

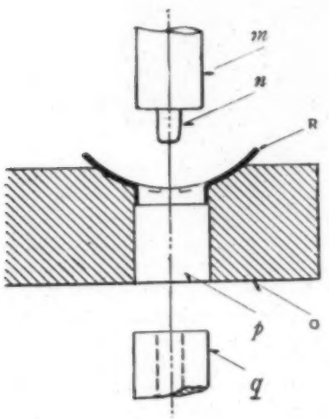


Fig. 18.

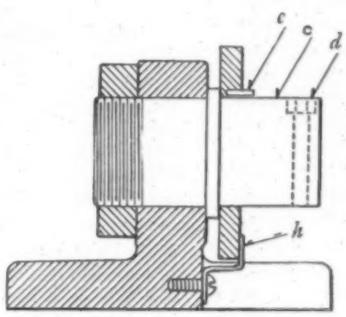


Fig. 20.

Fig. 22.

½-inch hole, p, was held in a bench vise. The material was number sixteen gauge, and reduced to about half this thickness without cracking. The rims were stiffer through this re-enforced hole than elsewhere.

Some work with straight sides and sharp angles may be cut out in dies such as shown in Fig. 19, which consists of four hardened steel pieces attached to a cast iron base. I have not found this to materially reduce the cost of the dies, but the straight sides of both punch and die may be ground true after hardening and in this way improve the work. The pawl and ratchet may be used in various forms for spacing holes or notches. Figs. 20 and 21 show the construction of a horn die used to punch holes in the side of a cylinder. In this case a notch in the edge of the work engaged the pin, e; the operator turned to the left until the pawl dropped into a notch and then held to the right while punching a hole. Ratchets are used for notching armature stampings where the ratchet is somewhat smaller in diameter than the work and lies horizontal.

Work on the side of a cylinder is commonly done in a horn press where a horn similar to c, Fig. 20, is attached directly to the back of the press.

The particular construction to adopt in making a die will often depend on shop conditions and tools available. The die shown in Fig. 2 contains the hardened ring, m, and the soft tool steel ring, k. These rings should be made weldless, and k may be either welded or brazed to the machine-steel punch body, i, while m should be ground on the extreme inside and outside and on the bottom. The ring, n, should be tool-steel, and may be welded by an expert smith, but if the smith is doubtful, it had better be forged without welding. When it is important to maintain a standard diameter of work, a hardened ring, l, or, in case of lettering or ornaments, a disc is used. In single-acting press dies it is the die center, l, rather than the interior of the punch, k, which determines the diameter of the work. It is well to have the interior of the punch a close fit in work, such as can ends, where the edge is all drawn in, but in cases where a radial edge is left, such as shown in Fig. 7, the punch may be comparatively loose. In double-acting press dies the inner punch determines the size and often the shape also of the work, while the die may not fit the work all the way but only at the upper corner.

In regard to foundry patterns for small die parts I have found it a matter of economy to have on hand 6 or 8 sizes of bottom plate patterns, u, Fig. 3, well made and varnished, with core prints and a core box to core the slots, z, straight sided and to leave a spot, w, to finish. To this base pattern "hurry up" pieces are added as needed for individual dies, the same base pattern being used for die Fig. 2 and die Fig. 3, with different additions and in case of Fig. 3 a central core. Die castings made from such patterns need not be machined all over.

In dies for double acting presses, which cut the blank as well as form it, a hardened and ground ring, e, Fig. 15, is used with a steel ring, c, welded to the wrought iron plate, b; these do the cutting, and when the corner, d, of ring, c, becomes dull it is upset by hammering on the lower face, which must then be turned up again to fit the hardened ring, e. The inside plunger, a, Fig. 15, may be made of machine steel, for working tin plate or brass; but for working steel it had better be either hardened steel or cast iron. In this particular die a little variation in the diameter of the inner punch, a, is of no consequence;

if the work had been blanked out first in another die, or cut into discs in the circle shears, then this die might have been made entirely of cast iron, and would consist of only three pieces similar to the die shown in Fig. 16, with perhaps a chilled surface, g.

The die shown in Fig.. 16 was made of cast iron, except the plate, l, which was of machine steel. The outer punch, i, and the die, k, were cast at a car wheel foundry, and the working faces, j and s, were chilled very hard. This die worked well on tin plate.. Another die, made of cast iron and chilled in the same way, working on black steel which had been annealed after the first operation and was rough, gave much less trouble than previous dies on the same work with hardened steel rings on the faces, although either had to be ground true and polished occasionally.

In drawing deep work, or in cases where the metal is severely worked, it is customary to anneal the work one or more times during the process; but tin plate is ruined by annealing; hence such work is drawn and annealed before plating, or, if some stiffness is required in the finished piece, one drawing operation may be performed after annealing and plating.

In cutting and forming bright steel it is customary to use oil as a lubricant and apply it in spots over the sheets before they are cut up into strips. In working tin plate the coating of tin, together with the thin film of oil left on it from tinning, are ordinarily sufficient lubrication; but in drawing large pieces in a double acting press a stick of parafine wax may be passed once around near the edge of the blank. In working black steel plate which is to be tinned afterwards, oil is objected to by the tinhouse foreman, as making him extra work, and an alkaline solution which will clean in an acid pickle is used, either soda water or a soapy water. One concern buys a soap made from fish oil, puts about a pound of this in a gallon of water and applies with a sponge to each side of the blank.

A day's work for a boy or a girl, and a press will depend upon the shape in which the stock comes to the press as well as the speed of the press and the dexterity of the operator. With a die, such as shown in Fig. 2, for cutting and forming ends, 4 inches in diameter or smaller, from tin plate cut into strips, 20 inches long, and wide enough for two rows of ends, an experienced operator will produce from 8,000 to 10,000 pieces in ten hours. With a similar die for making ferules for wood handles out of the scrap thrown into a pile, a boy will probably get 2,000 ferules in ten hours. A press with automatic feed, cutting bicycle chain links, will produce about 90 pieces a minute, working steel in long strips rolled up.

The gang die cutting and forming can ends from sheet shown in Fig. 4, cut about 11 sheets per minute, making two strokes to a sheet, while the other gang die described cut about 20 sheets a minute, but from this some time is to be deducted for handling stock, etc. A large drawing press on work from 10 to 20 inches diameter, and from 2 to 6 inches deep, will produce from 3,000 to 5,000 pieces in ten hours, but if such work does not "nest" well together it may occupy so much room as to retard the work.

The length of time that a die may be used at one sharpening will depend upon conditions and may vary from half a day to two months. The material of the punch and die, the material worked, the angle of the cutting edges, or the complement of a, Fig. 2, and the shear of the die, are the principal factors in the life of the cutting edge. I have seen dies used for ten weeks on tin plate at one sharpening. Fifty hours is about the average time in an electrical factory for dies cutting number 26 gauge soft steel. Dies cutting bright soft steel for builders' hardware, from $^1/_{16}$ to $^1/_8$-inch thick, with both punch and die hardened, run from two to four days at one grinding. Dies with square corners for cutting edges, and no shear on either punch or die, run about half as long as dies cutting the same pieces from the same stock, with a cutting edge of about 82 degrees, and with shear. The high and low points in the upper edge of m, Fig. 3, may be about $^1/_{16}$-inch difference in height, and the angle, a, Fig. 2, from 5 to 10 degrees.

The selection of a suitable press deserves more attention than is sometimes given to it, too small a press being liable to spring and injure the dies, while too large a press is slow and clumsy. Presses for cutting only may generally be much lighter than when used for cutting and forming combined. In a stamping factory the expense may often be greater for dies than for presses, and if a different press is more suitable, it may pay to buy it even though a first stands idle a part of the time.

The steel best adapted for sheet metal drawing is not readily distinguished from its performance in the regular tensile test, for drawing produces a different form of stress in the metal. We may represent an elementary section of a piece of sheet metal being drawn by Fig. 22, where p represents the tensile force due to the thrust of the press and c c the compression due to the wedge shape of the elementarry piece and its resisting the force p. As these elementary pieces abut against each other and are all coming in together, there is comparatively little friction for the force p to overcome, and the relative magnitudes of the forces may be represented by the triangle obtained by producing the two sides of the tapering part until they intersect. From this triangle of forces we may conclude that the change of form is due to tension in one direction combined with compression of about twice the magnitude in another direction, while the force in the third direction, or that of its thickness is only nominal, or just sufficient, to keep the wrinkles from forming. As the stock pulls over the corner, bends, and straightens again, the tensile stress is thrown first to one surface and then to the other, and in this way does more stretching than it otherwise would.

Several instances have come to my notice which would indicate that the action of steel under this combined stress of tension in one direction and compression in another, is different from that under either stress taken separately. The two examples mentioned above, where a 1⅜-inch hole could not be stretched to 2 inches without tearing, under tensile stress alone, and the wheel rim which stretched from $^9/_{64}$ to $^{18}/_{32}$-inch under a combined tensile and compressive stress, indicate something more than a variation in stock. In one case we fail to get an elongation of less than 50 percent, while in the other we get easily an elongation of 200 percent.

ISSUE TAKEN WITH MR. KEEP'S "CAST IRON."

To the Editor:

One of our leading trade papers in reviewing Mr. Keep's book, "Cast Iron," credited it with being a strictly practical work. In dissenting from this opinion let me cite two passages with which I take issue. On page 23 is an illustration, reproduced in Fig 1 of a roll having a shrink hole in the lower cast end, as at a. Not only does Mr. Keep advise us to look in the lower end of such castings for shrink holes, but seeks to verify his hypothesis by the following:

"Fig. 10 is a casting of a mill roll cast on end, the fluid metal being fed from the bottom. The sides cool first and the upper portion of the casting solidifies next. As the upper central portion becomes solid, the crystals pull away from each other toward the sides, forming along the central axis a loose spongy casting. As these cavities form, the metal will flow in from the top as long as it is fluid, causing the upper part to sink, but as soon as all above is solid, cavities may form, although too small to be visible. The iron having entered from the bottom, the last part to become solid is the lower part of the roll, and at this point there will not be enough metal to fill the space when cold, and the crystals pull away toward the surface until a large shrink hole A is the result."

Men of experience in making roll castings, know that Mr. Keep's explanation is entirely incorrect. The truth of the matter is that shrink holes, if they exist at all in rolls, are found in the upper cast end, the reverse of the theory advanced by Mr. Keep.

A second illustration is the effort to establish the existence of a phenomenon in the so-called "cooling curves," by an autographic recording machine shown in Fig. 101 on page 190 of "Cast Iron" and familiar to many. When this machine was first exhibited at Detroit in June, 1895, before the American Society of Mechanical Engineers, it astonished many observers. Upon reading a description of the machine, I made up my mind that all it was doing was retarding free contraction or stretching of the iron at intervals, as it cooled from a molten to a solidified, partially cold state. I had no opportunity to

verify my doubts as to the practicability of the machine until several years later. Learning that a machine was in use at the Columbia University I visited that institution in company with the well known mechanical engineer, Mr. Gus C. Henning. At the college we were accompanied by one of the professors to the room where the machine was used. When there I stated my belief that the machine was not frictionless, hence not only impractical but seriously misleading to investigators and the trade. I was asked how I could prove my position. Taking from my pocket a pair of 24-pound steelyards I hooked them on to the outer pin in the short arm of one of the levers seen in the illustration in Mr. Keep's book. I pulled on the steelyards until they registered 24 pounds and could not then move the lever. Continuing to pull, I moved the machine on the table and could have pulled it completely off without any sign of moving the lever. It is to be remembered that this strain was exerted upon one lever only, and that in testing a bar in a machine the friction of both levers would have to be overcome. Hence twice the load I was exerting would have to be applied and how much more is hard to tell, before the

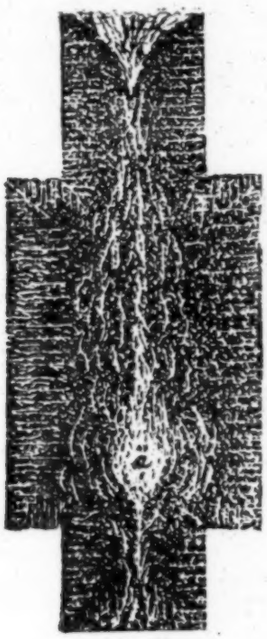


FIG. 1.

levers would move. Both Mr. Henning and the professor were astonished at this demonstration. If Mr. Keep or anyone else desires to establish the existence of any phenomenon, by the exhibition of cooling curves, he will require first of all a strictly frictionless machine, or one whose levers can almost be moved by a breath. All this machine accomplished was to put a strain upon the test bar during the contraction, a strain which, when exceeded by the friction which the machine exerted, let go with a jump or quick release, and recorded radical curves, instead of straighter lines. It is no uncommon occurrence for founders experienced in heavy work to observe that cast iron can be stretched or its contraction retarded in cooling, from a molten to a solid, partially cold state.

THOS. D. WEST.

Recent sales of the engineering department of the Pittsburgh Gauge & Supply Co., Pittsburg, include two 350 h. p. water tube boilers, with stokers and coal conveying apparatus for the Montrose pumping plant, Allegheny City, Pa.; eight stokers for the Allegheny City lighting plant; a 1,000 h. p. Patterson-Berryman water heater for the Whipple Colliery Co., as well as a 125 h. p. P.-B. water heater for the Lake Erie Limestone Co.

The Curtis & Curtis Co., Bridgeport, Conn., recently received through the United States Commissioner to the Paris Exposition a certificate announcing the award of a medal to that company for its exhibit of pipe-threading machines at the Exposition of 1900.

COAL PRODUCTION IN 1901.

According to returns to the U. S. Geological Survey from producers representing fully 97 percent of the entire coal output of the United States, the production in 1901 amounted to 292,240,758 short tons valued at $348,813,831. As compared with 1900, when the output amounted to 269,881,827 short tons, worth $306,891,364, this represents an increase of 22,358,931 short tons or 8 percent in quantity, and of $41,922,467 or 13.6 percent in value. The production of Pennsylvania anthracite showed a phenomenal increase from 51,221,353 long tons (equivalent to 57,367,915 short tons) in 1900 to 60,242,560 long tons or 67,471,667 short tons in 1901. This represented a gain of 17½ percent, the largest percentage of gain made by the anthracite trade in 20 years. Part of this increase in 1901 was due to a decreased output of anthracite in 1900 as compared with 1899, as owing to the historic strike of 1900 the output that year was reduced by over 2,500,000 long tons. The production last year shows an increase over 1899 of 6,297,913 long tons, and except for the strike of 1900 would have shown an increase over that year of 4,500,000 long tons, or about half the actual increase made.

The increase in the value of the anthracite product in still more striking, the amount received at the mines last year showing a gain of $27,746,169, or more than 31 percent over that of 1900. This was entirely due to the unprecedented period of prosperity which enabled consumers generally to pay higher prices for their fuel. The average price for the marketed anthracite coal—that is, the product shipped to market or sold to local trade, and exclusive of the colliery consumption which amounted to about 10 percent of the total—was $2.05, the highest figure obtained since 1888.

The production of bituminous coal, lignite, cannel coal, etc., including a small amount of anthracite from Colorado and New Mexico increased from 212,513,912 short tons in 1900 to 224,769,091 short tons in 1901, indicating a gain of 12,255,179 tons or about 6 percent. The value of this product amounted to $236,309,811 as compared with $221,133,513 in 1900, an increase of $15,176,298, or a little less than 7 percent. The price of the bituminous product did not show any material advance in 1901, the average being about 0.8 cent higher than in 1900.

Of the 27 States producing coal in 1901, all but four showed increased production. The four whose product decreased were California, Montana, New Mexico and Tennessee. The production by States is shown in the following table:

COAL PRODUCTION OF THE UNITED STATES IN 1901.

Bituminous.	Total Product.	Total Value.
Alabama	9,078,677	$9,987,811
Arkansas	1,784,136	2 033,193
California	151,079	394,166
Colorado	5,699,016	6,441,891
Georgia and North Carolina	354,825	426,685
Idaho	0	0
Illinois	27,313,396	28,452,278
Indiana	6,962,940	7,078 842
Indian Territory	2,406,943	3 887,793
Iowa	5,578,532	8,016,274
Kansas	4,880,526	5,973,381
Kentucky	5,487,994	5 208,094
Maryland	5,113,127	5,046 491
Michigan	1,040,530	1,543,756
Missouri	3,799,993	4,703.174
Montana	1,396,081	2,009,316
New Mexico	1,086,546	1 540,652
North Dakota	166,085	212,635
Ohio	19,625,723	19,789 958
Oregon	69,011	173,646
Pennsylvania	82,914,840	82 099 906
Tennessee	3,546 551	3,959,249
Texas	1,086,012	1,885,083
Utah	1,322,614	1,666,082
Virginia	2,953 999	2,523,270
Washington	2,578 217	4,271,070
West Virginia	23,816,434	20,908,705
Wyoming	4,485 374	6,060,462
Total Bituminous	224,769,091	$236,309,811
Pennsylvania Anthracite	67,471,667	112,504,020
	292,240,758	$348,813,831

The preliminary report issued by the Inspectors of Mines for Great Britain shows that the production of coal in the United Kingdom last year was 219,037,240 long tons, a decrease of 6,132,923 long tons from 1900. Reducing the product of the United States to the same unit, we find that it amounted to 260,929,248 long tons, or 42,439,760 long tons (nearly 20 percent) more than that of Great Britain. The coal output of her colonies and dependencies (including India) aggregated in 1900 about 17,000,000 long tons, so that taking all the British Empire as one producer it still falls short of the coal product of the United States last year by from 20,000,000 to 25,000,000 long tons.

Our coal production last year was nearly 80 percent larger than Germany's, nearly 7 times that of Austria-Hungary, and more than 8 times that of France.

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market and Some of their Wants:—

The Ohio Solid Steel Co. had its charter amended recently so as to increase the capital stock to $500,000. The stock is divided into $250,000 cumulative preferred 7 percent, and $250,000 common stock. This company was incorporated in New Jersey in May with a nominal capital of $2,000. The office of the company is in the Williamson Building, Cleveland. The site of the proposed plant has not been definitely determined, negotiations in several directions being under way.

Two steel ball bearing concerns were granted New Jersey charters last week. The companies are known as the German-American Steel Ball Co. and the Interstate Ball Bearing Co. The incorporators of both companies are F. G. W. Mack, L. C. F. Killian and George White, Jr.

The Lorenna Foundry Co., of Bridgeport, Pa., was granted a charter with $25,000 capital.

The Otto A. Meyer Co., Miwaukee, Wis., has been granted a charter with $100,000 capital. The company will erect a plant for the manufacture of horseshoes on an extensive scale. O. A. Meyer, D. C. Meyer, and H. C. Meyer are the incorporators.

The Kilbourne-Jacobs Mfg. Co., Columbus, O., has increased its capital stock from $1,125,000 to $1,250,000..

The Rogers Copper & Iron Co., Aberdeen, S. D., has been incorporated with $1,000,000 capital by C. H. Shuler, C. S. Hoskins, G. T. Smith, C. C. Gleckler, J. A. Ewing and W. J. Stark.

The Ruth Iron Co., of Duluth, Minn., has been incorporated with $15,000 capital. S. L. McNulty, R. F. Grant and J. W. Sullivan are the incorporators.

The Medina Foundry Co., Medina, O., has been incorporated with $15,000 capital by F. O. Phillips, Arthur Van Epp, H. C. Bradway, C. C. Engel, and Blake McDowell.

The B. F. Nell Co., of Chicago, has been incorporated with $20,000 capital to manufacture machinery. B. F. Nell, H. H. Rose and L. C. Rose are the incorporators.

The Peck-Williamson Heating & Ventilating Co., Cincinnati, O., has decided to erect a foundry at Wellston, O. A company will be organized under the name of the Peck-Williamson Foundry Co., with a capital of $100,000 to operate the plant. The daily output is to be 100 tons. Plans for the buildings are already being prepared.

The Union Foundry & Machine Co., Salt Lake City, Utah, has been incorporated with $15,000 capital. L. C. Sinclair is president; F. W. Brotzman, vice president; W. H. Fowler, treasurer and F. F. Betts, secretary.

The Columbia Steel Co., a connected interest of the Automobile & Cycle Parts Co., operating plants at South Chicago and Cleveland, has acquired a site at Elyria, O., on which a plant will be built for the manufacture of cold rolled steel strips and cold drawn rods. The main building will be 80x400 feet. A hot roll mill may be added later. The directors are M. B. Johnson, of Cleveland; A. L. Garford and Geo. H. Ely, of Elyria; Col. A. A. Pope, of Boston, and R. M. Coleman, of New York City.

D. W. Alderman & Sons' Co., Alcolu, S. C., is in the market for a second-hand duplex pump, with three to three and one-half suction.

Richmond Iron Works, Richmond, Va., has been incorporated with a capital stock of $100,000. The following officers have been elected: John Chamblin, president; George Cole Scott, vice president; Millard F. Cox, general manager; R. Massie Nolting, secretary and treasurer.

Petersburg Iron Works, Petersburg, Va., wants delivered prices on one 5x10x10 cross-compound throttling engine to make 200 revolutions per minute with 125 pounds steam, and on one water tube marine boiler of suitable size for this engine.

Donaldsonville Iron Works, Donaldsonville, La., has been incorporated with a capital stock of $25,000, to succeed the Donaldsonville Foundry & Machine Works. The incorporators are Charles Mourin, Joseph Constantine, John W. Tucker, Henry McCall, J. N. Colomb, and C. R. Alleman.

The Vulcan Mfg. Co., Milwaukee, Wis., has been incorporated with a capital stock of $75,000 to operate a malleable iron foundry. The company will erect a plant at Layton Park, a suburb of Milwaukee. The organizers of the company are E. Gilmore, Emil Langer and others.

The Cotton States Bridge Co., Atlanta, Ga., has been incorporated with a capital stock of $10,000 by J. T. Rose, W. M. Kelly and W. T. Young.

The Indianapolis Tin Co., Indianapolis, Ind., has been incorporated with $50,000 capital. The new concern will deal in tin and tinware in the capacity of jobbers. G. Johnson, E. T. Shubrick and J. B. Nelson are the incorporators.

The Central Barb Wire Fence Co., of Pekin, Ill., has been incorporated with $5,000 capital. Frank C. Carroll, Otto Koch, Thos. Cooper and E. Reardon are the incorporators.

The Excelsior Tool & Machine Co., of East St. Louis, Mo., has been incorporated with $75,000 capital. The new company will erect a plant for the manufacture of machine tools. T. F. Philippi, M. B. Nolan, E. M. McDonnell, E. Schiwitz and B. J. Buss are the incorporators.

The Downing Foundry Co., Denver, Col., has been incorporated with $10,000 capital to operate an iron foundry in Denver. M. Downing, J. D. Waldo and C. A. Stokes are the incorporators.

The Hayden-Corbett Chain Co., of Columbus, O., has been incorporated under the laws of New Jersey with $100,000 capital. W. S. Hanna, J. W. Dages and W. C. Orr are the incorporators. The location of the plant has not yet been decided upon.

The Superior Machine & Boiler Works, Chicago, Ill., has been incorporated with $10,000 capital to conduct a foundry and machine shop. W. H. Pontius, Peter Weiler and J. T. Smith are the incorporators.

The Rochester Stamping Co., Rochester, N. Y., has increased its capitalization from $300,000 to $500,000 in order that it may be able to better handle its growing business. The company in addition to disposing of its product in this country is selling large quantities abroad. At present 500 hands are employed with 44 salesmen constantly on the road.

New machinery will be installed by the Xenia paper mills at Xenia, O., recently bought by the Beveridge Paper Co., of Indianapolis

New machinery will be bought by the Portsmouth (O.) Veneer Works, now erecting a three-story brick addition 40x60 feet.

Fires and Accidents:—

The plant of the Sunbury Iron Works, Sunbury, Pa., was damaged $20,000 by fire last week.

The plant of the Vulcan Iron Works, Toledo, O., suffered a loss of $35,000 by fire last week. The machine and erecting shops were completely wrecked while the foundry was damaged by water.

The machine shop and nut departments of the Oliver Iron and Steel Co., Pittsburg, were partly destroyed by fire this week; loss, $10,000.

The plant of the Nichols & Shepard Thresher Co., Battle Creek, Mich., was destroyed by fire last week. Loss $100,000.

The Gendron Iron Wheel Co.'s storerooms and machine shops were partly destroyed by fire June 6. Loss $10,000.

Brunk & Heyer's machine shop at Lorain, O., was damaged by fire to the extent of $6,000, May 25. It will be rebuilt at once.

Fire destroyed the planing mill, engine room and power plant of the Illinois Car & Equipment Co., at Hegewich, Ill., June 4, causing a loss of $75,000. The planing mill will be rebuilt to about twice its former size. Arrangements have already been made for temporary quarters.

New Construction:—

The Chambersburg Engineering Co., Chambersburg, Pa., is building an addition to its foundry, 60x150 feet, doubling its capacity. A number of new tools have been installed in the extensive machine shops.

J. A. Carmody will rebuild his foundry and machine shop at Cedar Rapids, Ia., on the adjustment of fire losses.

A sheet mill and open-hearth furnace will be built in connection with the new plant of the Wheeling Roofing & Cornice Co., of Wheeling, W. Va., now going up at New Martinsville, W. Va. A tin mill 60x320 feet, with eight pots, is now being completed. The galvanizing plant is 70x320 feet; the corrugat-

ing department, 60x200 feet; eave trough shop, 50x150 feet; building for stamped metal work, 180x400 feet.

A plant for the manufacture of acetylene gas apparatus will be located at Wapakoneta, O. A site of 15 acres and $12,000 has been donated.

The contract for the erection of an addition to the Danville Foundry & Machine Co.'s plant at Danville, Ill., has been let. It will be two stories, 175x50 feet, and will connect the machine shop and foundry.

John McNamara, of Barberton, O., has given 10 acres of land in West Barberton for the erection of a machine shop and foundry.

It is reported that the plans for the two new blast furnaces to be erected in connection with the plant of the Alabama Steel & Wire Co., at Ensley, Ala., have been completed. It is stated, however, that it has not been definitely decided to erect the plant at Ensley.

William Sellers & Co., Philadelphia, will erect a new flask shop and foundry addition at 16th and Buttonwood Sts., 115x117 feet.

Plans have been drawn for a new brick building 70x190 feet for the Lumen Bearing Co., 1155 Sycamore St., Buffalo. The building will be erected in the rear of old plant at the above number.

The Quaker Mfg. Co., Chicago Heights, Ill., has commenced work on its new plant. The foundry will be 70x150, one story; erecting shop and shipping building, 50x200, two stories; warehouse, 50x150, one story. There will be an engine and boiler house and pattern shop in addition. This company will manufacture hot air furnaces and combination hot air and hot water heaters.

The Lansing Wheelbarrow Co., Lansing, Mich., is reported to be contemplating extensive additions to their plant for the manufacture of steel road scrapers.

The Twin City Fence & Wire Co., St. Paul, Minn., is building a foundry on Water St., 35x80, one story high.

The Hewitt Mfg. Co., Chicago, has had plans prepared for a brass foundry to be erected on a site 40x100 feet, at the corner of Emerald Ave. and 40th St. The plant will cost about $100,000.

The Worth Brothers Co., of Coatesville, Pa., contemplate extensive additions aside from their new plate mill. They are laying out a new plant on the opposite side of the Philadelphia & Reading Railroad from the present works, the arrangement of which will admit of a number of open-hearth furnaces in addition to the four modern 50-ton furnaces now in course of erection.

St. Louis Car Wheel Co., St. Louis, Mo., has purchased a site in Atlanta, Ga., on which it will erect a branch plant. The main building will be 95x230, with wings for engine and boiler house, coke ovens and cupola.

The Hager Rolling Mill, East St. Louis, which was destroyed by fire recently, will be rebuilt at once.

Charles H. Bellack & Co., of Milwaukee, Wis., will erect a three-story manufacturing plant, 50x100 feet in Hartford, Wis. It will be equipped with electrical power throughout, and will cost $10,000.

Fairbanks, Morse & Co., Chicago, will erect additional buildings at their Beloit, Wis., plant, as follows: foundry, 132x93; pump erecting shop, 90x300; warehouse, 80x150, and a power house. The new buildings will cost $125,000.

Follansbee Bros. & Co., Clarksburg, W. Va., have purchased a tract of 200 acres of land, on which, it is reported, they will build a tinplate mill.

The Wolcott Windmill Co., Saginaw, Mich., will build a machine shop for the manufacture of gasoline engines.

At the Hartman plant of the Cuyahoga Wire & Fence Co., New Castle, Pa., a new engine house and annealing and cleaning departments are being added. The building for the cleaning and annealing departments will be 80 feet long and 60 feet wide.

The New Castle Bolt & Forge Co., New Castle, Pa., will erect an addition to its plant 64 feet long and 60 feet wide. It will be used mainly for storage purposes. Owing to the large amount of business now closed the plant is also to be operated double turn.

The Republic Iron & Steel Co., has decided to replace its 12-inch mill at its Brown-Bonnell plant, Youngstown, O., with a modern continuous mill. This will make four continuous mills in this plant. There is also talk of reconstructing the 8-, 10-inch and hoop mills and plans are under way.

The St. Louis Car Wheel Co., St. Louis, Mo., has decided to erect a wheel foundry at Atlanta, Ga. The foundry building will be 230 feet long and 95 feet wide with wings for the engine and boiler house. The cost of the plant is estimated at $75,000.

The Owen Machine Tool Co., Springfield, O., will erect a modern machine shop, 75x250 feet in dimensions. As soon as the new building is completed the present shop will be abandoned.

The Lauer & Harper Co., Baltimore, Md., will erect a structural fitting shop 100 feet long and 60 feet wide. The office building will be 30x50 feet and the power house 30x50 feet. This company was incorporated last April with $50,000 capital and does a general engineering and constructing business. The officers of the company are W. J. Lauer, president; J. A. Smyser, vice president; I. O. Harper, secretary and treasurer. The new plant will cost about $25,000.

The A. Streit Machine Co., Cincinnati, O., will build a two-story plant, 50x150 feet.

The Pittsburg District:—

The demand of the iron molders in this district for an advance of 10 percent has been denied by the foundrymen. At a mass meeting of the molders held this week it was decided to modify their demand to a request and another effort will be made to secure the advance from the founders.

A strike of steel workers in the Singer, Nimick & Co., LaBelle and Aliquippa plants of the Crucible Steel Co. of America, Pittsburg, Pa., has resulted in shutting down a number of the departments in these plants. The teemers and pullers out are the men who claim to have a grievance and are asking for an advance of 15 percent. The strike is not serious.

The Keystone Rolling Mill Co., Ltd., Pittsburg, has been dissolved, the mill having been sold to the Fort Pitt Iron & Steel Co., about a year ago. The mill is located on Second Ave., Pittsburg.

The Empire Chain Co., of Pittsburg, has been incorporated with $1,000 capital by Joseph J. Sehn, W. G. McKenney and A. L. Ober.

The machinists employed in Pittsburg and vicinity have made a demand for an advance in wages of 10 percent and a minimum of $3 per day for all hands except apprentices. The manufacturers are requested to reply on Wednesday, June 18.

During the month of May the Edgar Thomson plant of the Carnegie Steel Co. produced 51,480 tons of rails, which is 800 tons better than the best previous record. This does not include some 6,000 tons of waste steel in the rail and bloom mills.

Contracts for pumping machinery for installation in the Allegheny, Pa., pumping station were awarded last week. The Snow Steam Pump Co. was awarded the contract for furnishing two pumps with a daily capacity of 15,000,000 gallons, while the Allis-Chalmers Co., of Chicago, was awarded a contract for the erection of a pump with a daily capacity of 5,000,000 gallons. The Pittsburg Gauge & Supply Co. was awarded the contract for installing the boilers and stokers for the plant.

The Pressed Steel Car Co. has decided to increase the output of its recently acquired Hegewisch plant and the output of steel underframes will be increased fully 50 percent. This will greatly aid in increasing the production of cars from 180 to 200 daily.

The Monarch Iron & Steel Co., of this city, is negotiating with the city of Rochester for the purpose of securing a bonus to locate their plant at that place.

The Washington Coal & Coke Co., of this city, will erect 100 additional coke ovens at its plant, Star Junction, Pa. The company now operates 475 ovens at this place.

The Neeley Nut & Bolt Co., of Pittsburg, has applied for a Pennsylvania charter with a nominal capitalization of $1,000. The new corporation will take over the business of

the Marland-Neeley Co., Ltd. The incorporators are John Bindley, Edward Bindley, Thomas Neeley and others. The plant is located on South 22nd St.

The Burns Uniform Steel & Metallic Co., of Pittsburg, will shortly award contracts for the erection of a crucible department to its plant at Latrobe, Pa. The plant will contain an open-hearth department with four furnaces of 25 tons capacity each, a rolling and a crucible department to contain 48 pots. The headquarters of the company are in the Lewis building.

The business formerly conducted by John Eichleay, Jr., of Pittsburg, of house moving and dealing in structural steel has been discontinued under this name and will be conducted hereafter under the name of the John Eichleay, Jr., Company. John Eichleay, Jr., is president; J. P. Eichleay, vice president and W. B. Eichleay, secretary and treasurer.

At a meeting of the directors of the Standard Underground Cable Co., held in Pittsburg, it was decided to issue shares amounting to $500,000, the proceeds to be used in extending the plant of the company at Perth Amboy, N. J. The product of the company consists of cables for electric lighting purposes, electric railways, telephone and telegraph purposes.

The business of the National Tube Co., which was formerly conducted at McKeesport, Pa., will hereafter be conducted from the main office in the Frick building. The offices of the Monongahela Furnace Co., have also been removed to the same building.

The Carnegie Steel Co. will erect a fifth furnace at its Carrie plant, Rankin, Pa. The furnace will be 105 feet high and 22 feet in diameter. It will have a daily capacity of 600 tons. Two additional furnaces are also under erection at the Edgar Thomson plant, while a fourth furnace, as already noted in these columns, will be erected at the Ohio plant of the National Steel Co., Youngstown, O. This stack will be 110 feet high and 21 feet in diameter.

General Industrial Notes:—

The Niagara Screw Co., formerly at Perry and Mississippi Sts., is now in its new brick building at 20 Lock St., Buffalo.

The stockholders of the J. C. McNeil Co., of Akron, O., manufacturer of boilers, held a meeting on June 3 and elected the following officers: President, George A. Kempel; vice president, B. L. Dodge; secretary and treasurer, J. H. Miller. These officers together with H. F. Cook and F. H. Adams, constitute the board of directors. J. Ben Campbell continues as general manager of the company.

The Jansen Steel & Iron Co., Oxford, N. J., will build three double puddling furnaces in addition to the sixteen furnaces it now has.

The Aspinwall Mfg. Co., of Jackson, Mich., has specialized in the manufacture of agricultural machinery with unusual success. It is the one concern in the world making a complete line of potato planting and handling machinery, from cutter to sorter. In addition it makes cotton sprayers, weeders, churns, post-hole augers and lawn swings. The inventor of the Aspinwall machinery has given 40 years to the development of his specialties, and improvements have been constant. The potato machines have been on the market for about 25 years. The Aspinwall company has had a business this season 50 percent greater than in any previous year, and the prospect is that enlargements will be necessary in the near future. L. A. Aspinwall is president; C. W. Brega, vice president, and C. G. Rowley, manager and treasurer.

The Buffalo Roll & Forge Co. has changed its name to the Buffalo Engine Co. It manufactures machinery and makes specialties of roll grinding and corrugating and drop forging. The company has recently moved into new quarters and its shops are now 12-20 Perry St. and 68-80 Washington St.

The Youngstown Iron Sheet & Tube Co., Youngstown, O., has taken over the Alice Furnace operated by Pickands, Mather & Co., at Sharpsville, Pa. The furnace is producing about 250 tons daily. The product will be used eventually in the basic open-hearth steel plant the Youngstown company is to build at Haselton.

At the annual meeting of the South Chicago Furnace Co., Chicago, Ill., held last week, R. F. Howe was elected a director in the place of D. M. Cummings. Mr. Howe is a member of the Deering Harvester Co. No change in the capitalization was announced, which at present is $300,000. The investment, however, amounts to $1,000,000. Work is already going forward on the new blast furnace but it will be fully a year before it is completed.

The Edgar S. Low Co., Empire Building, Pittsburg, has sold the Pennsylvania Steel Co. a new 36-inch gauge Vulcan locomotive of special design for mill service at Steelton.

The abandoned steel tube plant of the Heckert-Baltzley Billet Co., Findlay, O., was sold at sheriff's sale last week to Stilson Hutchins for $60,000. The plant will now be entirely dismantled and the machinery sold piecemeal.

The new plant of the Columbia Foundry & Machine Co., St. Joseph, Mo., was placed in operation last week. The plant consists of two buildings, one for molding and the other is used as a machine shop and cleaning room. The main foundry department is 60x100 feet and contains two cupolas. The cleaning room is 40x60 feet while the machine shop is 60x60 feet. A general foundry business will be done. T. C. Roberts is president and treasurer of the company, Eugene Dengler, vice president, and W. C. Ransom, secretary and general manager.

Work on the erection of the new pipe mill of the Susquehanna Iron & Steel Co., at Columbia, Pa., was commenced last week. The plant was designed by Engineer Victor Beutner, of Pittsburg.

The Bethlehem Steel Co., South Bethlehem, Pa., has been awarded the contract for furnishing the cast iron segments to be used in the tunnel under the North River at New York City. That the order may be filled as speedily as possible a portion of the old Bessemer plant will be converted into a foundry.

The annual meeting of the stockholders of the Lorain Steel Co., of Pennsylvania, was held at Johnstown, Pa., last week. Daniel Coolidge, P. M. Boyd, E. B. Entwisle, Patrick Lavelle and George Suppes were re-elected directors. Mr. Lavelle will continue as general manager of the Johnstown plant.

The Falcon plant of the American Sheet Steel Co., at Niles, O., is now closed in all its departments. It is probable that it will be abandoned entirely as a sheet mill.

Weed & Co., of Buffalo, N. Y., have been awarded the contract for the erection of Machinery Hall by the St. Louis Exposition Association, St. Louis, Mo. The building will be 1,000 feet long and 500 feet wide and will be built largely of steel.

The Birmingham Machine & Foundry Co., Birmingham, Ala., is erecting two large blowing engines for the Central Iron Co., of Tuscaloosa, Ala. The engines are said to be the largest ever built in the South.

Gen. E. Burd Grubb, of Edgewater Park, N. J., has sold to the Lebanon Valley Furnace Co., Lancaster, Pa., his 1-96th interest in the Cornwall iron ore banks for $112,500. Gen. Grubb, who with John Meily owned the Lebanon Valley Furnace, sold that plant to the same company also for a consideration of $112,500.

The United States District Court last week authorized the Continental Iron Co. to operate the Wheatland, Pa., plant for another year beginning July 1, under a trustee as at present. Important improvements and additions are being made and these will be completed within a few months. The puddling department was placed on double turn this week and the plant is enjoying the benefits of the prosperity in the iron trade.

Work on the installation of two additional cupolas at the Bessemer plant of the Republic Iron & Steel Co., Youngstown, O., was commenced this week. These cupolas will enlarge the capacity of the converting department without necessitating additional converters. The replacement of the present convertors by 10-ton vessels and the enlargement of the blooming mill will no doubt be deferred for some time as it is impossible to shut down the plant at present to make the improvements.

The Youngstown Mfg. Co., Youngstown, O., has placed the contract for one of the engines for its new bar mill with the Wm. Tod Co., of Youngstown, O.; that for the other with the Buckeye Engine Co., of Salem, O. The company has also placed a contract for 1,000 h. p. boilers divided equally between the Cahall Sales Department and the Sterling Co. The contract for the roll train will be placed this week. S. V. Huber & Co., of Pittsburg, are consulting engineers.

IMPROVED GERMAN WIRE NAIL MACHINE.

In discussing the advancement made in wire nail machines and the latest types that have appeared in Germany for the production of wire nails, *Stahl und Eisen* says that there has been very little improvement in the manufacture of wire nails during the past decade when compared with the progress in other lines of iron and steel manufacturing. Many of the machines in operation today show little improvement over those introduced half a century ago, while the principle of operation remains practically unchanged. The first wire nail machines were built in France during the third decade of the last century and the wire nail industry flourished immediately in that country. From the time the first machine was built to 1854 no less than 40 patents were issued to French inventors, all dealing with wire nail machinery. The wire nail machine was introduced into Germany in the forties and

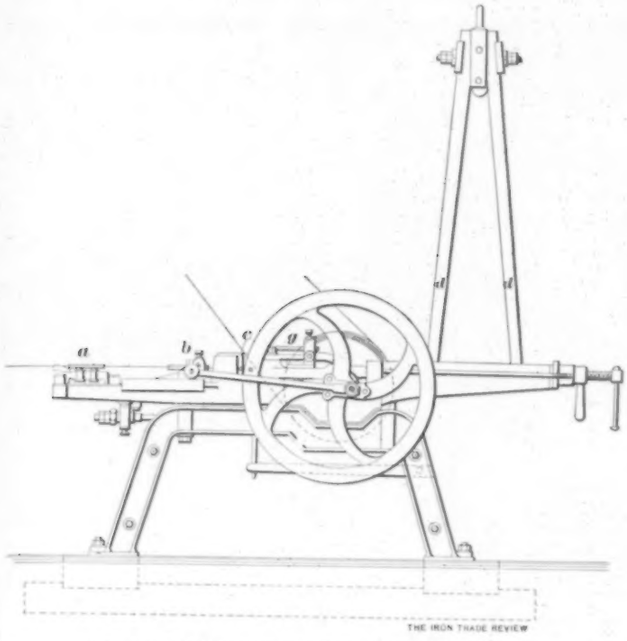


FIG. 1.—WIKSCHTRÖM & BAYER WIRE NAIL MACHINE.

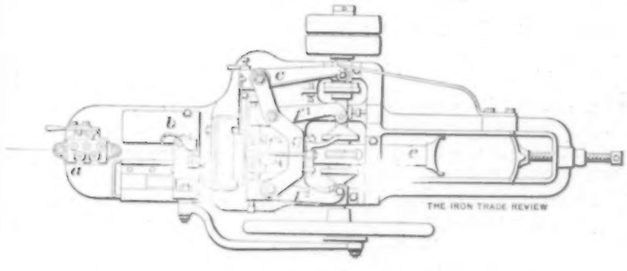
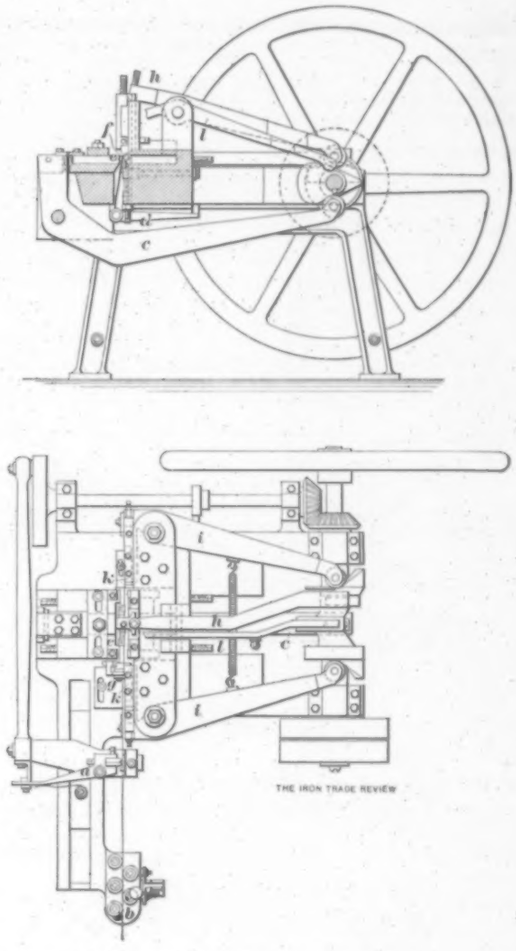


FIG. 2.—WIKSCHTRÖM & BAYER WIRE NAIL MACHINE.



FIGS. 7 AND 8.—ELEVATION AND PLAN OF WIKSCHTRÖM & BAYER WIRE NAIL MACHINE.

open and the wire is drawn forward the length of the nail that is being manufactured. This operation is followed by the pointing of the nail by means of knives, F3 and F4 operated respectively by levers F1 and F2 after which the nail is thrown into a hopper and the operation is repeated.

During the last decade many attempts have been made to increase the output of German wire nail machines and this has been attempted by introducing into the machine from two to ten wires so that a like number of nails might be produced at one revolution. Another method attempted introduced a number of wires above one another which were pointed simultaneously by a device an indicated in Fig 3. In all of these machines, however, the entire mechanism was brought to a standstill in case one wire was caught, a bad feature that inventors have been unable to overcome.

In all the machines on the market today there is a considerable loss of material in the pointing of the nail. Further-

that country soon manufactured all the wire nails it consumed and commenced to build up a large export trade. The exports of wire nails alone during the past year amounted to 54,000 tons from German ports.

Today nearly every country in the world manufacturing iron and steel products aims to produce all the wire nails it consumes, and Russia, by the aid of a high tariff, has 25 wire nail factories producing 75,000 tons of nails annually. Despite the immense growth of the industry, the principle of operating the machines has not been materially changed.

In the operation of the machines now generally in use the wire is drawn through five straightening rolls, denoted by A in Figs. 1 and 2, by means of a vise B, and is next clamped between the jaws C1, operated by means of a lever C. The wire projects from the jaws a small distance and this projection is used for the making of the head of the nail. After the jaws are closed the pressing of the head follows by means of an eccentrically operated hammer E, after which the jaws

more, if the knives are not exceedingly sharp and fit perfectly the clippings remain hanging on the points and if they are not removed in cleaning the nails are condemned and thrown away. To prevent the waste in pointing machines were introduced for pressing points on the nails but these also have proved unsuccessful to a very large extent.

The firm of Wikschtröm & Bayer, of Düsseldorf, Germany, now have a wire nail making machine on exhibition at the Düsseldorf Exposition, which prevents the waste brought about by pointing the nails with knives and which threatens to revolutionize the wire nail industry. By means of this machine two nails may be produced from one piece of wire without loss in the pointing. The great value of the invention lies in the knives, shown in Fig. 4, which operate like a shear. In pointing, the wire section, which is the length of two nails, is given a twist as indicated in Fig. 6 after which both nails are pointed by one cut of the knives. The sketches in Fig. 5 show the different operations in the cutting.

The operation of the machine is simple and is as follows: The wire is drawn through the straightening rolls B, Figs. 7 and 8, by means of the vise A and is held firm by the jaws E and a clamping device F operated by levers C and D. In the next operation the wire is cut the length of the two nails by the cutting device G, operated by the lever C, after which the clamps press the wire against the stationary knife below. The nails are next pointed by the knife operated by lever H and at the same time the two nails are headed by dies K operated by the two levers indicated by I. The jaws E and the clamp F then are opened and the nails are dropped into a hopper by means of a striking device operated by the lever L. By this operation there is absolutely no loss while the length of the point can be adjusted to any desired size. In addition the heads are formed perfectly and the loss from imperfectly pointed nails is nil. The following table shows the saving by the operation of this machine over other machines on the same sized nail during a period of 16 hours of continuous operation:

Type of Machine.	Nails per Minute.	Total No. Nails.	Loss percent
Stamp machine	120	115,200	2.75
Pressing machine	140	134,400	2.75
Wikschtröm & Bayer machine	240	230,400	None

Inasmuch as there is no loss by the operation of this machine it is estimated that the saving, in comparison with the production, amounted to 69.68 kg. As the large German wire nail factories produce from 300 to 400 tons of scrap every year it can be seen that there is an immense saving by the operation of a machine that makes no scrap whatever. In addition the operation of this machine is said to require less power than any machines now on the market and the operation of all the parts is so smooth that very little noise is made.

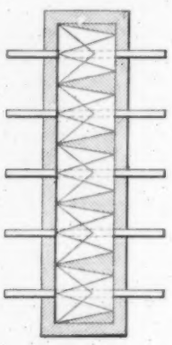


Fig. 3

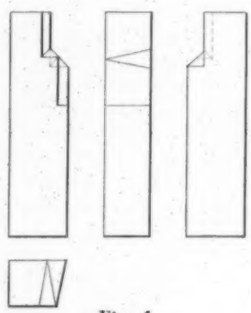


Fig. 4

Fig. 6

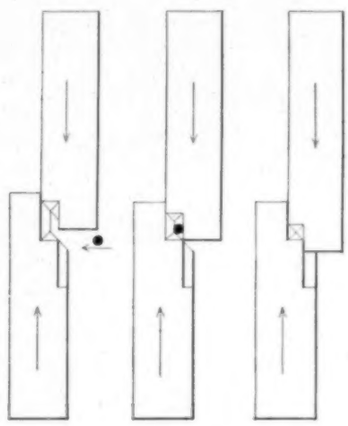


Fig. 5

WIKSCHTRÖM & BAYER WIRE NAIL MACHINE—ILLUSTRATIONS OF PROCESS OF POINTING.

The new plant of the National Steel & Wire Co., Hartford, Conn., which will take the place of the plant destroyed by fire about a year ago, will probably be placed in operation about July 1. There are eleven buildings on the site as follows: Rod mill, machine shop, pickling department, boiler house, engine house, wire drawing department, nail and fence departments, galvanizing department, wire rope department warehouse and a storehouse. The rod mill will have a daily capacity of about 300 tons while the daily output of the wire mill will amount to about 250 tons. The cost of the completed plant will be about $1,000,000.

It is reported that the Sloss-Sheffield Steel & Iron Co., Birmingham, Ala., is negotiating for the purchase of the properties of the Ivy Coal & Coke Co., located about 25 miles west of Birmingham. The company's property consists of about 14,000 acres of coal land and a large number of coke ovens. About $500,000 is involved in the deal.

OBITUARY.

Geo. W. Brown, vice president, treasurer and general manager of the Case Manufacturing Co., of Columbus, O., died in that city on June 6, of paralysis, aged 48. He was well known for his invention of labor-saving machinery for flouring mills. His engineering experience was largely in connection with milling operations. His first connection with the Case Manufacturing Co., which makes a specialty of electric traveling cranes, was in 1884. From 1892 to 1897 he was in Birmingham, Ala., and Indianapolis, and in 1897 returned to Columbus.

Nathan Babcock, head of the Babcock Printing Press Manufacturing Co., of New London, Conn., died at Westerly, R. I., May 31, aged 77 years. He became an apprentice in a machine shop at Warwick, Conn., in 1842. In 1855 he joined with the late Calbert B. Cottrell, of the firm of Cottrell & Babcock, in the manufacture of cotton and woolen machinery at Pawtucket. Later they manufactured power printing presses, employing 200 men in this work, as against a half dozen at the start. In 1880 Mr. Babcock retired from the firm and in 1882 with Chas. T. Fenner and Chas. B. Maxson, formerly in his employ, organized the Babcock Printing Press Works at New London. He was secretary and treasurer of the company to the day of his death, going back and forth daily from his home in Westerly.

Lyman Hubbell, proprietor of the Fillmore Avenue Iron & Foundry Works, Buffalo, died on May 27, aged 56 years.

John B. Swaim, formerly president of the National Iron & Steel Co., Nashua, N. H., died on June 3 aged 74 years. For many years he was a leading figure in industrial circles in New England.

William S. Eaton, formerly treasurer of the National Department of the National Tube Co., McKeesport, Pa., died at his home in Boston on June 2. He was born in Boston, April 2, 1817, and was one of the pioneer tube manufacturers of the United States. He was one of the original organizers of the National Department of the National Tube Co. and became one of the directors of the consolidation.

E. A. Delano, of Chicago, who has been actively connected with the machinery business in that city for 30 years, died in Denver, Col., on June 5, of consumption. Mr. Delano has operated a machine shop in Chicago under his own name for 25 years, but owing to ill health had resided in Denver for the last two years. He was 56 years old.

The adjourned meeting of the United States Steel Corporation, which was to have been held this week, has again been postponed until June 30.

The Bass Foundry & Machine Co., Fort Wayne, Ind., last week shipped a large boiler and its equipment to a large starch factory located at Aguascalientes, Mex.

Cochrane Feed Water Heaters

Did you know that a **Cochrane Feed Water Heater and Purifier** will improve any boiler feed supply, no matter how bad? Are you acquainted with the fact that a **Cochrane Heater** will heat about 14 per cent more water with 14 per cent less steam than what is required if a closed heater is used?

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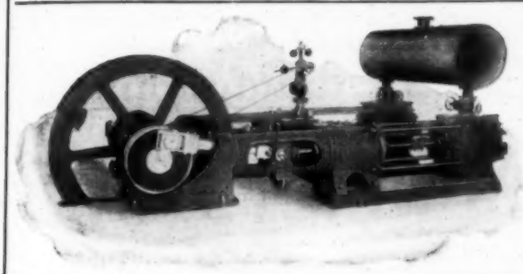

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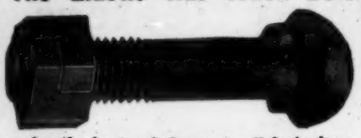

makesthe best and cheapest rail-fastening. NUTS NEVER WORK LOOSE. Requires no nut-lock. Our Elastic Self-Locking Steel Nut always stays, and is superior for use on Cars, Track, Bridges, Machinery etc. Write us for prices on Sq. and Hex. Nuts, (Elastic or Common) Machine Bolts, Track Bolts, Rivets, etc.

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HENDRICK MFG. CO.,
Samples and information upon request. Carbondale, Pa.

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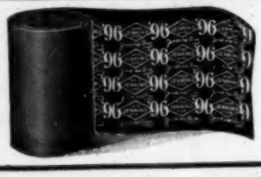

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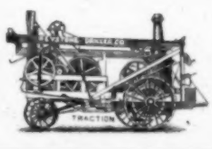

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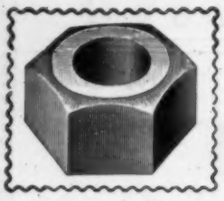

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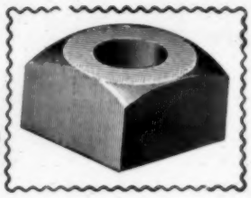

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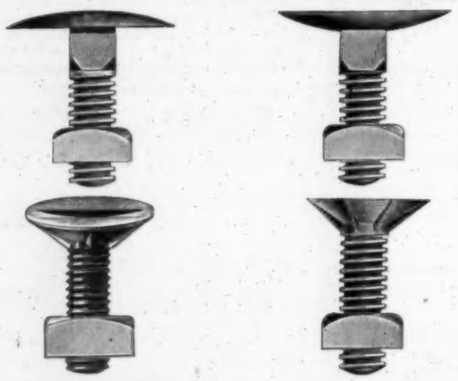

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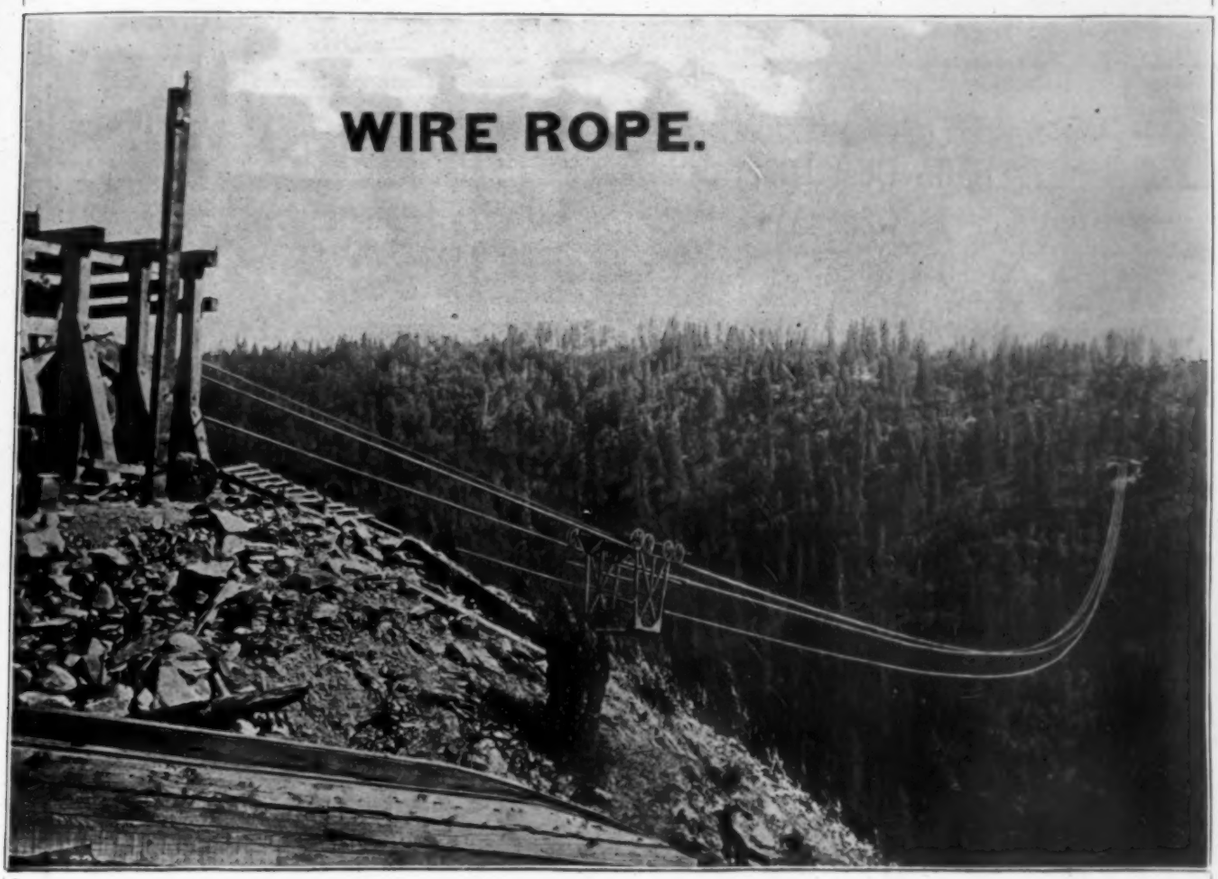

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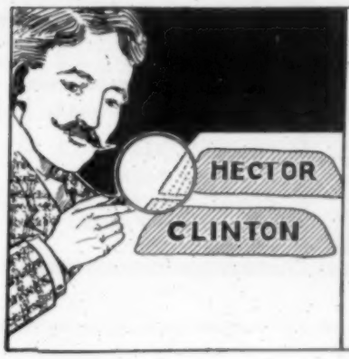
CLEVELAND, OHIO.



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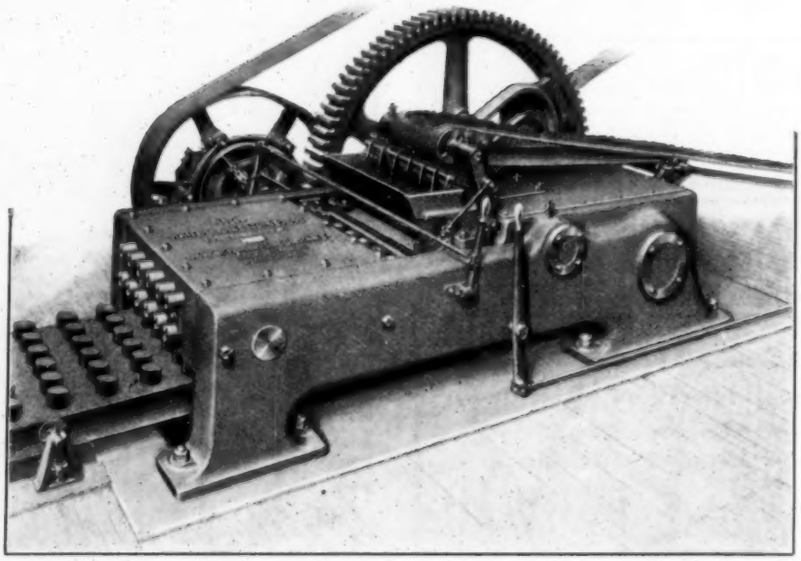

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